Railway Maintenance Engineer

Volume 17 CHICAGO—MARCH, 1921—NEW YORK Number 3

VERONA TOOL WORKS

PITTSBURGH

International
Steel Crossing Foundations

Why Is the Cost of Crossing Maintenance So High?

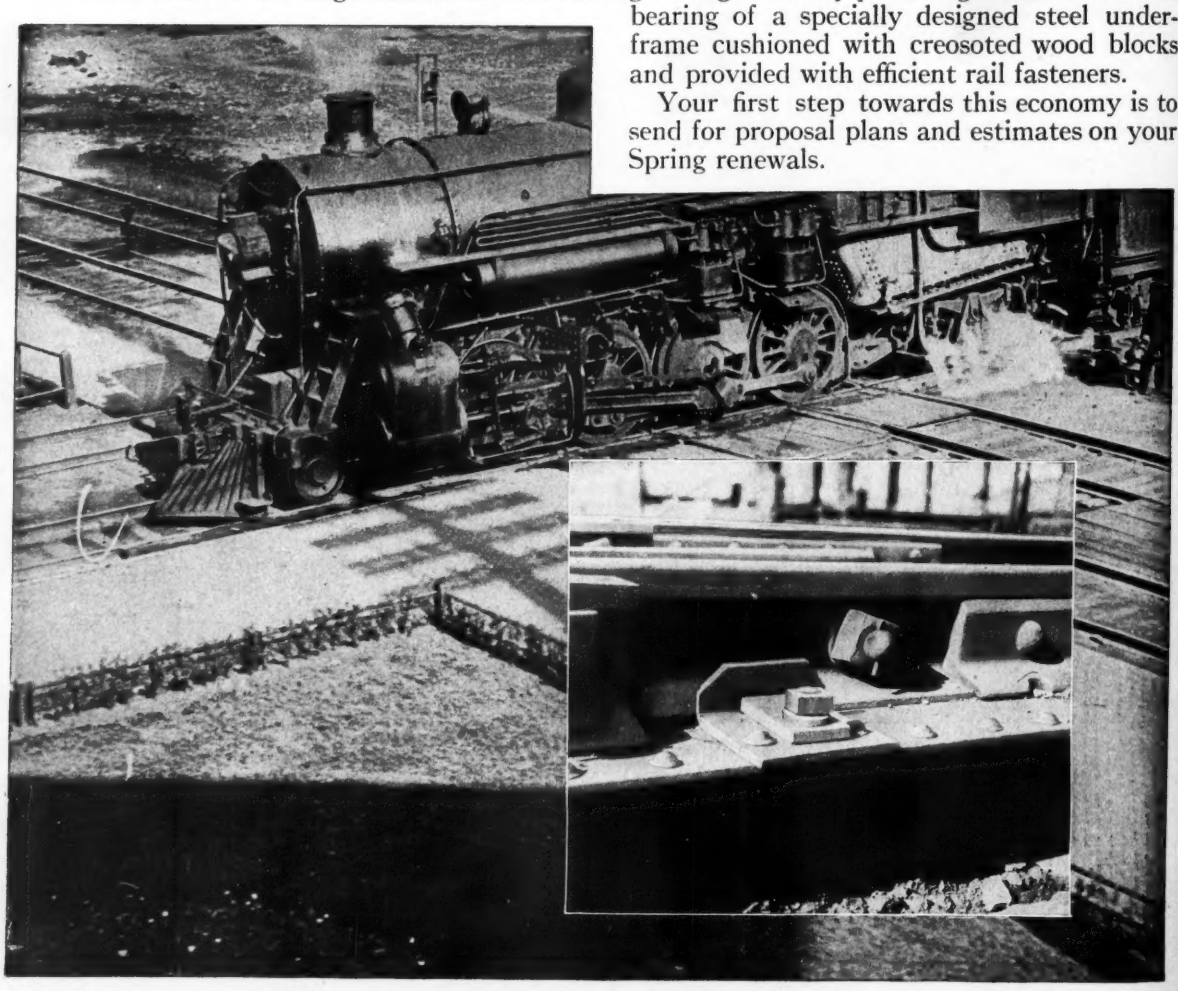
BECAUSE wooden ties cannot be arranged under crossings so as to distribute the loads into the ballast.

If they are located to carry one track, the other must go unsupported.

The rocking, twisting shocks of relentless wheel loads over worn flangeways loosen and break bolts and fillers; movement starts between the members of the crossing and rapid wear and deterioration result.

Users of Steel Crossing Foundations are cutting the high costs by providing a wide based unit bearing of a specially designed steel underframe cushioned with creosoted wood blocks and provided with efficient rail fasteners.

Your first step towards this economy is to send for proposal plans and estimates on your Spring renewals.



The International Steel Tie Company

Manufacturers of Steel Twin Ties and Crossing Foundations

16704 Waterloo Road, Cleveland, Ohio

RAILWAY MAINTENANCE ENGINEER

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Alphabetical Index to Advertisements, Page 5 Classified Index of Advertisers, Pages 5 and 6

What Cleansing Metals Means

The proper cleansing of metal means the elimination of those impurities that impair its strength, solidity and homogeneity.

Cleansing any metal makes it a pure metal. In metals subject to severe vibratory stresses, as most metals in railway service are, it enables them to withstand these stresses.

Hence, longer life and better service while life lasts.

Boronic Products

are provided for the treatment of any metal and for any purpose.

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To the Metal Manufacturer or the Individual Mixer of Metals:
PLEASE USE THIS COUPON

American Boron Products Co., Inc., Reading, Pa. R. Mt. E. 3-21
Gentlemen:—Kindly send me complete details regarding the many ways whereby I can economize by using Boronic Alloying Metals.
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City _____
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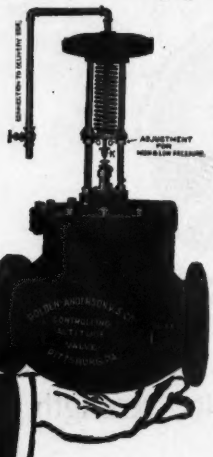
☞ Our literature mailed to employer and employee who aim for IMPROVED PRODUCTS

☞ Our Price List (with changes found necessary from time to time) may be found filed at the SERVICE STATIONS of The Reuben H. Donnelley Corporation, Publishers of the DONNELLEY'S RED BOOK—in the leading cities.

"Yes—They're the Valves I Want"

for many a vexatious problem in water distribution systems and a positive cure for all needless water waste due to overflow of Tanks, Standpipes and Reservoirs.

For Fire Service

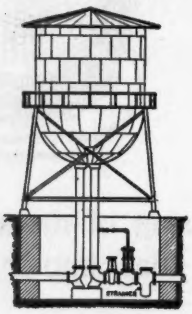


Sizes to 24"

A POSITIVE WATER SUPPLY

ABSOLUTELY ASSURED BY

Golden-Anderson Automatic Cushioned Controlling Altitude Valves



For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyances of Freezing and Float Fixtures inside or outside of Tanks. "Three Ways of Closing These Valves."

1st—Automatically, by Water.
2nd—By Electricity, if desired.
3rd—By Hand.

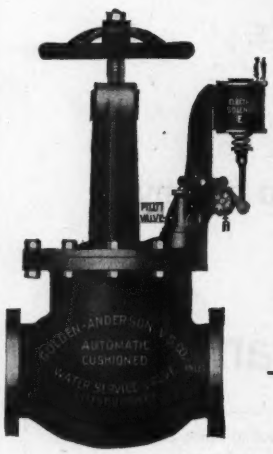
May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.

No valves or fixtures inside or outside.

Made with stop starter attachment for centrifugal pumps

Valves Cushioned at all times by air and water
No water hammer or bursting mains
"NO METAL-TO-METAL SEATS"

"Hosts" of R. R. "References"



Golden-Anderson Cushioned Electric Water Service Valves

No waste of current, as it is only on solenoid a few seconds on either opening or closing of valve.

May be closed and opened from remote points electrically; also hand operated.

Air and water cushioned. No metal-to-metal seats. Virtually indestructible.

Sizes to 24"

Golden-Anderson Automatic Cushioned Water Regulating Valves

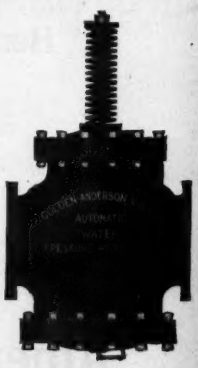
for high or low pressure service are a *necessity* for modern waterworks and railroads.

Positive in action and perfectly cushioned both in opening and closing.

Will maintain a constant pressure regardless of the volume of the initial flow.

When fitted with electric attachment, valve can be instantly opened to full area from any number of distant points, thus insuring full pressure in case of fire, etc.

Sizes to 24"



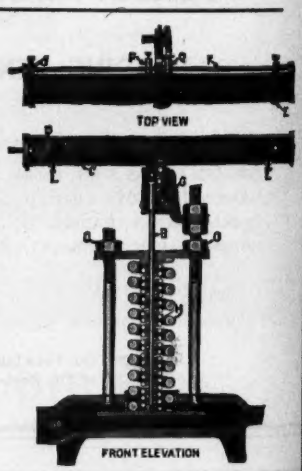
(Angle or Straight Way) up to 24 in.

GOLDEN-ANDERSON Patent Automatic Cushioned Float Valves

1. Accurately control the water-level between fixed points in tanks, hot wells, etc.
2. Positively cushioned by both water and air.
3. Operate without surges, water hammer or shock.
4. Float swivels to any angle making installation easier.
5. Adjustable for fast or slow operation.

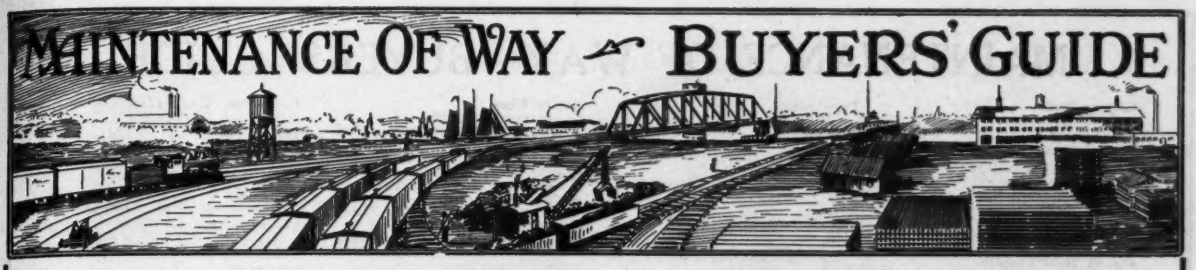
GOLDEN-ANDERSON Patent Electrical Stop and Starters

1. Automatically start and stop motor driven pumps by variation in water level or operate signal bells when the head rises or falls beyond the desired limits.
2. Do away with the annoyance of floats, float-switches and chains.
3. Can be installed inside or outside. No danger of freezing.
4. Very simple throughout. There is nothing to stick, break or give trouble.
5. Uninterrupted automatic service always assured.
6. Easily adjusted to operate between various levels.



Golden-Anderson Valve Specialty Co.
1202 Fulton Building, Pittsburgh, Pa.

MAINTENANCE OF WAY BUYERS' GUIDE



ALPHABETICAL INDEX TO ADVERTISEMENTS

A

Air Reduction Co., Inc 11
American Boron Products Co., Inc. 3
American Casting Co. 42
American Chain Co., Inc..... 9
American Hoist & Derrick Co.... 20
American Manganese Steel Co.... 43
American Saw Mill Machinery Co. 44
American Valve and Meter Co... 28
American Well Works..... 29
Armco Culvert & Flume Mfrs. Assn. 45

B

Balkwill Manganese Crossing Co.. 41
Bethlehem Steel Company 43
Bucyrus Co. 19

C

Carbic Mfg. Co..... 8
Chicago Steel Post Co..... 7
Chipman Chemical Engineering Co., Inc. 12-13

D

Des Moines Bridge and Iron Co... 44
De Vilbiss Mfg. Co., The..... 39
Diamond State Fibre Co..... 36
Dixon Crucible Co., Joseph..... 36
Duff Mfg. Co. 15
Du Pont, E. I., De Nemours & Co., Inc. 16

F

Fairbanks, Morse & Co..... 20
Fairmont Gas Engine and Ry. Motor Car Co..... 24

G

Gardner Governor Co., The..... 35
Golden-Anderson Valve Specialty Co. 4
Graver Corporation 32-33

I

Indianapolis Switch and Frog Co. 40
Industrial Works 18
Ingersoll-Rand Co. 10
International Steel Tie Co..... 2

J

Johnson, Edward E., Inc..... 36

L

Lidgerwood Mfg. Co..... 42
Lufkin Rule Co., The..... 42
Lundie Engineering Corp..... 36

M

Massey Concrete Products Corp... 39
Minwax Co., Inc..... 14

N

National Lock Washer Co., The.. 23

P

P. & M. Co., The..... 31
Pelton Steel Co..... 37
Pittsburgh-Des Moines Steel Co.. 44
Positive Lock Washer Co..... 21

R

Rail Joint Co..... 38
Ramapo Iron Works..... 25
Rawls Mach. & Mfg. Co..... 42
Republic Creosoting Co..... 22

S

Southern-Rome Co..... 24
Spray Engineering Co..... 38
Standard Paint Co., The..... 38
St. Louis Frog and Switch Co.... 40
Stowell Co..... 38
Sullivan Machinery Co..... 41

T

Templeton, Kenly & Co., Ltd..... 34
Track Specialties Co..... 40

U

United States Switch Co..... 30

V

Verona Tool Works 1

W

Warren Tool and Forge Co..... 41
Weir Frog Co..... 40
Wharton & Co., Wm., Jr..... 17
Worth Wire Works 30

CLASSIFIED INDEX OF ADVERTISERS

Acetylene, Dissolved.
Air Reduction Co., Inc.

Adjustable Rail Clamps.
Wm. Wharton, Jr., & Co.

Air Compressors.
Fairbanks, Morse & Co.
Gardner Governor Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Hoists.
Ingersoll-Rand Co.

Air-Lift Pumping Systems.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Alloy Steel Castings.
Pelton Steel Co.

Anchors.
P. & M. Co., The.

Anti-Acid Alloy.
American Boron Products Co.

Anti-Creepers.
P. & M. Co., The.

Apparatus, Brazing, Welding and Cutting, Heat Treatment.
Air Reduction Co., Inc.

Argon.
Air Reduction Co., Inc.

Asphalt.
Standard Paint Co.

Asphalt Shingles.
Standard Paint Co.

Automatic Pump Starters.
Golden-Anderson Valve Specialty Co.

Automatic Valves.
Golden-Anderson Valve Specialty Co.

Barges and Hulls.
Des Moines Bridge & Iron Co.
Pittsburgh-Des Moines Steel Co.

Barrels.
Diamond State Fibre Co.

Bars.
Bethlehem Steel Company.

Belt Driven Pumps.
Gardner Governor Co.

Benders, Rail.
American Chain Co., Inc.
Reading Specialties Co.
Verona Tool Works.

Billets.
Bethlehem Steel Company.

Blasting Powders.
E. I. du Pont de Nemours & Co.

Blasting Supplies.
E. I. du Pont de Nemours & Co.

Blow Pipes, Oxy-Acetylene.
Air Reduction Co., Inc.

Boiler Feed Pumps.
Gardner Governor Co.

Bolts.
Bethlehem Steel Company.

Bond Wire.
Armco Culvert & Flume Mfrs. Assn.

Booster Pumps.
Gardner Governor Co

Boronic Zinc Alloy.
American Boron Products Co.

Brazing.
Air Reduction Co., Inc.

Buildings.
Des Moines Bridge & Iron Co.
Pittsburgh-Des Moines Steel Co.

Building Papers.
Standard Paint Co.

Bunks.
Southern-Rome Co.

Burners, Bunsen, Acetylene.
Air Reduction Co., Inc.

Calcium Carbide.
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Car Jacks
Duff Manufacturing Co.

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Cars, Velocipede.
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Fairmont Gas Engine & Ry. Motor Car Co.

Castings.
American Manganese Steel Co.
Bethlehem Steel Company.

Cattle Guards.
Fairbanks, Morse & Co.

Cattle Passes.
Massey Concrete Prod. Corp.

Clutch Linings.
Diamond State Fibre Co.

Coaling Stations.
Des Moines Bridge & Iron Co.
Fairbanks, Morse & Co.
Pittsburgh-Des Moines Steel Co.

Compromise Joints.
Bethlehem Steel Company.

Compromise Rail Joints.
Track Specialties Co.

Conduits.
Diamond State Fibre Co.

Copper Cleansers.
American Boron Products Co.

Corrugated Iron.
Armco Culvert & Flume Mfrs. Assn.

Cranes, Erecting.
Industrial Works.

Cots.
Southern-Rome Co.

Cranes, Locomotive.
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Cranes, Wrecking.
Bucyrus Company.
Industrial Works.

Creosote Oil.
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Crossings.
American Manganese Steel Co.
Balkwill Manganese Crossing Co.
Bethlehem Steel Company.
St. Louis Frog & Switch Co.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Crossing Foundations.
International Steel Tie Co.

Culverts.
Armco Culvert & Flume Mfrs. Assn.

Culvert Pipe, Cast Iron.
American Casting Co.

Culvert Pipe, Concrete.
Massey Concrete Prod. Corp.

Curbing.
Massey Concrete Prod. Corp.

Cutting, Oxy-Acetylene.
Air Reduction Co., Inc.

Derails.
American Chain Co., Inc.
Reading Specialties Co.
Track Specialties Co.
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Disinfectants.
Chipman Chemical Engineering Co., Inc.

Ditchers.
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American Manganese Steel Co.
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Graver Corporation.

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Gardner Governor Co.

Float Valves.
American Valve & Meter Co.
Golden-Anderson Valve Specialty Co.

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Duff Manufacturing Co.
Bethlehem Steel Company.

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Sullivan Machinery Co.

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American Manganese Steel Co.
Balkwill Manganese Crossing Co.
Bethlehem Steel Company.
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MAINTENANCE OF WAY—BUYERS' GUIDE

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Bethlehem Steel Company.

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Ingersoll-Rand Co.
Keystone Grinder & Mfg. Co.

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Bethlehem Steel Company.
Ramapo Iron Works.
Wm. Wharton, Jr., & Co.

Guard Rail Clamps.
American Chain Co., Inc.
Ramapo Iron Works.
Reading Specialties Co.
Track Specialties Co.
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Fairbanks, Morse & Co.

Hand Car Engines.
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Lidgerwood Mfg. Co.

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Jos. Dixon Crucible Co.

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Bethlehem Steel Company.

Machinery, Gas Producers.
Air Reduction Co., Inc.

Malleable Castings.
Stowell Co.

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American Manganese Steel Co.

Manganese Steel Castings.
Pelton Steel Co.

Manganese Track Work.
Balkwill Manganese Crossing Co.
Bethlehem Steel Company.
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Ramapo Iron Works.
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Fairbanks, Morse & Co.
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Oil Houses.
Massey Concrete Prod. Corp.

Oil Pumps.
Gardner Governor Co.

Ordnance.
Bethlehem Steel Company.

Out Houses.
Massey Concrete Prod. Corp.

Outfit, Welding.
Air Reduction Co., Inc.

Oxygen.
Air Reduction Co., Inc.

Paints.
Chipman Chemical Engineering Co., Inc.
Jos. Dixon Crucible Co
Standard Paint Co.

Paint Spraying Equipment.
De Vilbiss Mfg. Co., The.
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Bucyrus Company.
Industrial Works.

Piling.
Massey Concrete Prod. Corp.

Pinions.
Diamond State Fibre Co.

Pipe, Cast Iron.
American Casting Co.

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Pneumatic Tie Tampers.
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Massey Concrete Prod. Corp.

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Power Pumps.
Gardner Governor Co.

Preservatives.
Chipman Chemical Engineering Co., Inc.

Producers, Gas.
Air Reduction Co., Inc.

Pumps.
American Well Works.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Pump Governors.
Gardner Governor Co.

Push Cars.
Fairbanks, Morse & Co

Rail Anchors.
P. & M. Co., The.

Rail Anti-Creepers.
P. & M. Co., The.

Rail Benders.
Fairbanks, Morse & Co.
Reading Specialties Co.
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Bethlehem Steel Company.
Ramapo Iron Works.
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Rail Joints.
American Chain Co., Inc.
Rail Joint Co.
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Rail Saws.
Fairbanks, Morse & Co.
Industrial Works.

Rare Gases.
Air Reduction Co., Inc.

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Gardner Governor Co.

Regulators, Oxy-Acetylene.
Air Reduction Co., Inc.

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American Chain Co., Inc.
Reading Specialties Co.

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Verona Tool Works.

Rivets.
Bethlehem Steel Company.

Rock Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Rods, Welding.
Air Reduction Co., Inc.

Roof Slabs.
Fairbanks, Morse & Co.
Massey Concrete Prod. Corp.

Roofing and Siding.
Fairbanks, Morse & Co.

Rules, Boxwood.
Lufkin Rule Co., The.

Rules, Spring Joint.
Lufkin Rule Co., The.

Rules, Steel.
Lufkin Rule Co., The.

Saw Mills.
American Saw Mill Machinery Co.

Scales, Mechanics'.
Lufkin Rule Co., The.

Screw Spike Drivers.
Ingersoll-Rand Co.

Sewer Pipe.
American Casting Co.
Massey Concrete Prod. Corp.

Sewer Pipe Seal Compound.
Standard Paint Co.

Sheets, Fibre.
Diamond State Fibre Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.

Signal Foundations, Concrete.
Massey Concrete Prod. Corp.

Slabs, Concrete.
Massey Concrete Prod. Corp.

Smoke Stacks.
Des Moines Bridge & Iron Co.
Massey Concrete Prod. Corp.
Pittsburgh-Des Moines Steel Co.

Special Analysis Steel Castings.
Pelton Steel Co.

Spikes.
Bethlehem Steel Company.

Spraying Equipment, Paint.
De Vilbiss Mfg. Co., The.

Spike Mauls.
Warren Tool & Forge Co.

Spreader Plow.
Bucyrus Company.

Standard Tee Rails.
Bethlehem Steel Company.

Standpipes.
American Valve & Meter Co.
Des Moines Bridge & Iron Co.
Fairbanks, Morse & Co.
Pittsburgh-Des Moines Steel Co.

Station Houses.
Massey Concrete Prod. Corp.

Steam Engine Governors.
Gardner Governor Co.

Steam Pumps.
Gardner Governor Co.

Steam Shovels.
American Hoist & Derrick Co.
Bucyrus Company.

Steel Castings.
Pelton Steel Co.

Steel Plates and Shapes.
Bethlehem Steel Company.
Des Moines Bridge & Iron Co.
Pittsburgh-Des Moines Steel Co.

Steel Posts.
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Steel Ties.
International Steel Tie Co.

Step Joints.
American Chain Co., Inc.
Rail Joint Co.
Reading Specialties Co.

Storage Tanks.
Des Moines Bridge & Iron Co.
Pittsburgh-Des Moines Steel Co.

Street Railway Special Work.
Bethlehem Steel Company.

Structural Steel.
Bethlehem Steel Company.

Switches.
Balkwill Manganese Crossing Co.
Bethlehem Steel Company.
Indianapolis Switch & Frog Co.
Ramapo Iron Works.
St. Louis Frog & Switch Co.
Track Specialties Co.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Switch Locks.
American Valve & Meter Co.
United States Switch Co.

Switchmen's Houses.
Massey Concrete Prod. Corp.

Switch Stands.
Wm. Wharton, Jr., & Co.

Switchstands and Fixtures.
American Valve & Meter Co.
Bethlehem Steel Company.
Fairbanks, Morse & Co.
Indianapolis Switch & Frog Co.
Kilby Frog & Switch Co.
Ramapo Iron Works.
Weir Frog Co.

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Ingersoll-Rand Co.

Tanks.
Des Moines Bridge & Iron Co.
Fairbanks, Morse & Co.
Pittsburgh-Des Moines Steel Co.

Tanks (Oil Storage).
Graver Corporation.

Tanks (Steel).
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Tank Valves.
American Valve & Meter Co.

Tapes, Measuring, All Kinds.
Lufkin Rule Co., The.

Telegraph Poles.
Massey Concrete Prod. Corp.

Telephone Booths.
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Throttling Governors.
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Tie Plates.
Bethlehem Steel Company.
Lundie Engineering Corp.
Track Specialties Co.

Tie Rods
Bethlehem Steel Company.

Tie Spacers.
American Chain Co., Inc.
Reading Specialties Co.

Tin Plate.
Bethlehem Steel Company.

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Tools, Oxy-Acetylene Welding and Cutting.
Air Reduction Co., Inc.

Torches, Blow Acetylene.
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Air Reduction Co., Inc.

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Air Reduction Co., Inc.

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Track Bars.
Warren Tool & Forge Co.

Track Chisels.
Warren Tool & Forge Co.

Track Drills.
Fairbanks, Morse & Co.

Track Insulation.
Diamond State Fibre Co.

Track Jacks.
Duff Manufacturing Co.
Templeton, Kenly & Co., Ltd.
Verona Tool Works.

Track Material.
Balkwill Manganese Crossing Co.
Indianapolis Switch & Frog Co.
Ramapo Iron Works.
Weir Frog Co.

Track Pans.
Des Moines Bridge & Iron Co.
Pittsburgh-Des Moines Steel Co.

Track Scales.
Fairbanks, Morse & Co.

Track Tools.
Fairbanks, Morse & Co.
Verona Tool Works.
Warren Tool & Forge Co.

Track Wrenches.
Warren Tool & Forge Co.

Trestle Slabs.
Massey Concrete Prod. Corp.

Vacuum Pumps.
Gardner Governor Co.

Valves.
Golden-Anderson Valve Specialty Co.

Varnish, Electrical Insulating.
Standard Paint Co.

Washers.
Diamond State Fibre Co.

Water Column.
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Water Crane.
American Valve & Meter Co.

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Standard Paint Co.

Water Regulating Valves.
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Pittsburgh-Des Moines Steel Co.

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Weed Destroyer.
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Chipman Chemical Engineering Co., Inc.

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The RED TOP Guarantee

WE guarantee RED TOP Steel Posts will not break, burn, rot or frost-heave in the fence line; that they are free from defects in material and workmanship; that they will outlast the heaviest fencing manufactured.

We guarantee RED TOP Posts to be just as represented in our literature and advertising.

Any RED TOP Post which does not fulfill the above guarantee will be replaced by your dealer —without cost or argument.

BROOKE ANDERSON, *Pres.*
CHICAGO STEEL POST CO.

Railway Representatives

Maintenance Equipment Co.
Railway Exchange Bldg., Chicago, Ill.

For booklet describing RED TOP Guaranteed Steel Fence Posts and their money saving features, address **Maintenance Equipment Co., Railway Exchange Bldg., Chicago, Ill.**

Red Top
GUARANTEED
Steel Fence Posts

Carbic

Portable Lights

No. 1

Cadet

Model C

NO matter what your portable lighting requirements are, you can select exactly the equipment you need from the Carbic Line. There are styles ranging in weight from 12 lbs. to 200 lbs. fully charged.

Each model has its particular use but all operate on the same Carbic principle.

Carbic cakes supply the gas, making possible a clear and powerful light with no soot or smoke. No wasted fuel, no muss or bother to charge. Carbic Lights are portable, safe and economical.

Most railroads have adopted Carbics as standard. May we show you why?

Come over and see us at Booth No. 15
National Ry. Appliances Exhibit, Chicago, March 14th to 18th

No. 2

No. 3

Model M

Drums of Carbic

Carbic Manufacturing Company

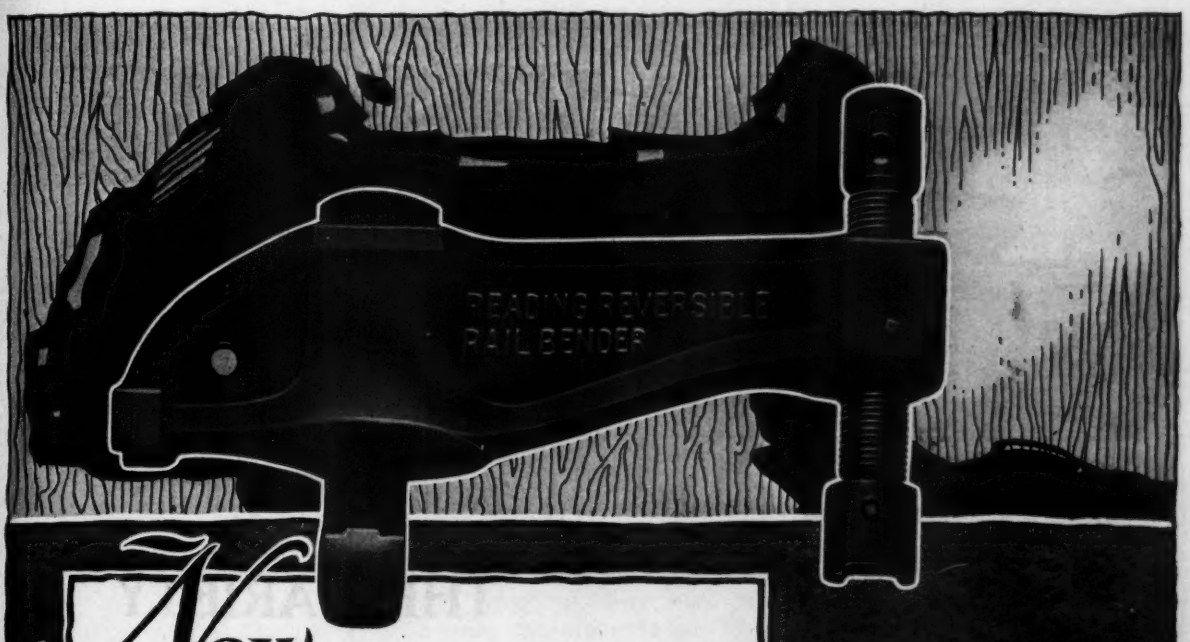
Duluth, Minnesota

Sales Offices:

NEW YORK, 141 Centre Street
BOSTON, 27 School Street
CHICAGO, 111 W. Washington Street
PHILADELPHIA, 18 South 7th Street

Representatives and Stocks in all Principal Cities

Carbic Cakes save money, time and patience, and yield a purer gas.



Now—

One Does the Work of Two

THE essential qualities of Two Benders—a right and left bender—are now combined in one.

One Bender, doing the work of two, means economy—economy in initial expenditure, economy in operation and economy in transferring tools to and from the jobs. The

READING
Reversible Rail Bender

bends within ten inches of the end, either right or left, without bolting additional rail lengths or splice bars to the rail. This feature saves time and labor in making guard rails and stocking switch rails.

The trunnion construction in the screw end eliminates bending strain and keeps the screw at right angles to the rail.

Write for particulars

READING
COMPROMISE OR STEP JOINT

A steel casting with the metal so distributed to have the most effective structural shape at the point of greatest strain.

All joints and fits are guaranteed.

AMERICAN CHAIN CO., Inc.
Reading Specialties Division, Dept. RS4

Bridgeport, Connecticut

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General Sales Office: Grand Central Terminal, New York City

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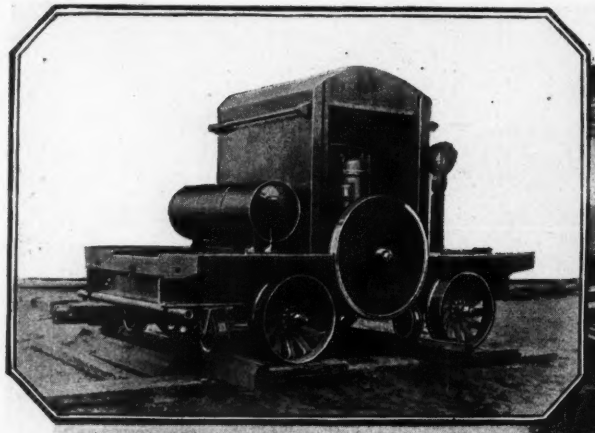

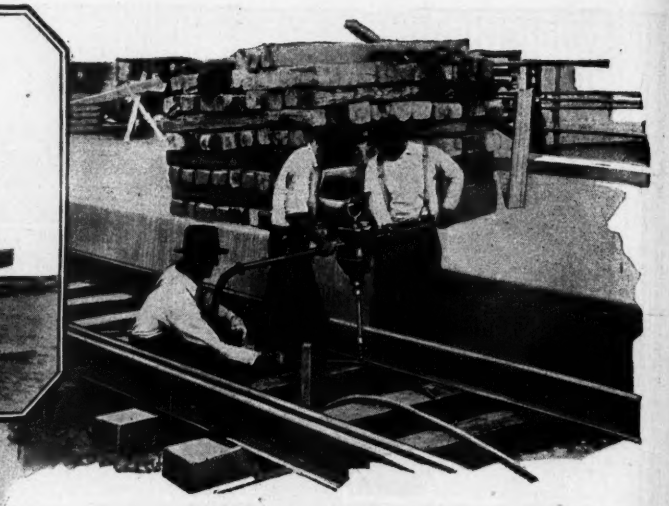

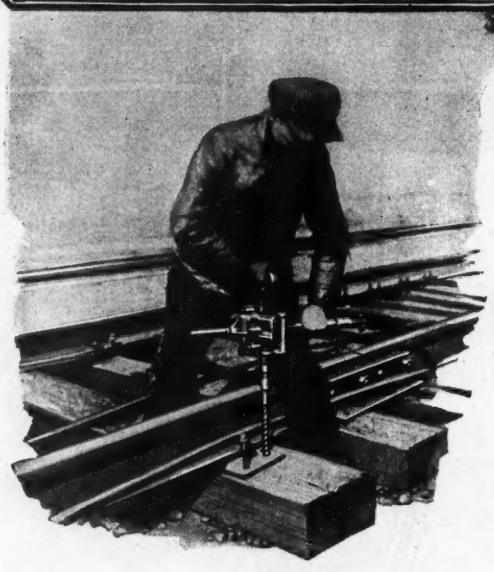

THE VARIETY

of USES for

"IMPERIAL" PNEUMATIC TIE TAMPING OUTFITS

Altho the big work of "Imperial" Tamping Outfits is tamping ballast, they are adaptable to many other operations which may be performed by air tools with pronounced saving in time and labor.

For instance, the compressor cars are often used to operate pneumatic drills for boring holes in ties, running down screw spikes and lag screws, tightening bolts, drilling and reaming holes in rails for bonding and rail joints.

"Imperial" Compressor Cars supply the air for other air tool uses, such as grinding rails and switch points, riveting and chipping, ramming earth or concrete, drilling for rock excavation, etc. They offer definite savings over old hand methods.

PRICE OIL ENGINES

INGERSOLL-RAND COMPANY
General Offices: 11 B'way, New York

Ingersoll-Rand

150-TT

AIRCO

LOOK FOR THE YELLOW CYLINDERS

Look for the yellow Airco Oxygen Cylinders and the black Airco Acetylene Cylinders at the National Railway Appliances Exhibition in March.

They indicate the Airco Exhibit—Welding Headquarters—the place to discuss your welding and cutting problems; the place to see the new Airco "A" Welding and "D" Cutting Torches in actual demonstrations; and the place to learn why

"AIRCO OXYGEN AND ACETYLENE SERVICE IS GOOD SERVICE"

Our space number is 167.
But forget the number.
Look for the yellow and
black cylinders.

AIR REDUCTION SALES COMPANY

Manufacturers of Airco Oxygen, Airco Acetylene, Airco Welding and Cutting Apparatus and Other Airco Products.

Home Office:
120 BROADWAY,
NEW YORK, N. Y.

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Chicago	**Johnstown, Pa.**	**St. Louis**
Cleveland	**Madison, Ill.**	**Seattle**
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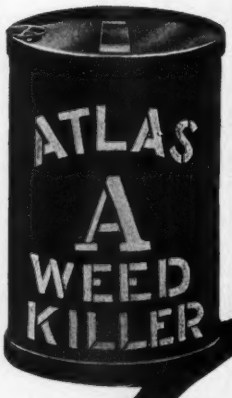
Airco warehouses at intermediate points

Bold type indicates the city contains an Airco District Office in addition to plant. Address correspondence to nearest District Office.

AIRCO



What Do You Know About Weeds ?

Are You Working in a Circle

destroying the tops, fertilizing the soil—stimulating the roots and encouraging re-growth by hand pulling—burning or steaming or

Are You Using

ATLAS "A"

SERVICE

THE DIRECT ROUTE TO COMPLETE ERADICATION OF TRACK VEGETATION

Send for Booklet "How to Keep a Clean Track"

CHIPMAN CHEMICAL

136 Liberty Street

We Are Weed Specialists

THESE pictures record an actual test made with ATLAS "A" on horsetail, the most difficult weed to kill.

First Picture
Before Treatment

Second Picture
48 Hours After Application

Third Picture
49 Days After Application

Fourth Picture—*132 Days After Application*

ENGINEERING COMPANY, INC.

New York City, N. Y.

MINWAX MINWAX MINWAX MINWAX MINWAX MINWAX

TRADE MINWAX MARK

The Original Elastic Membrane Waterproofing System

MINIMIZES MAINTENANCE

Adequate and dependable sub-level water protection for a railway structure is an engineering problem to be correctly solved only by a proper correlation of all known factors. Inexperienced application of unrelated materials purchased at random, will never give the results anticipated.

The Minwax System is a scientific correlation of materials designed and manufactured to function perfectly in combination under specific conditions known in advance, with permanent protection as the end sought. Minwax engineers are ready to cooperate with railway men, with a specialized experience of years in waterproofing problems. A failure-free record of over 14 years under severest service tests distinguishes the Minwax System from mere combinations of random materials and random labor.

Let us send Bulletin 21

MINWAX COMPANY, Inc.
Manufacturers and Consulting Engineers on Waterproofing Problems

18 East 41st Street, New York
Chicago: 327 So. La Salle Street
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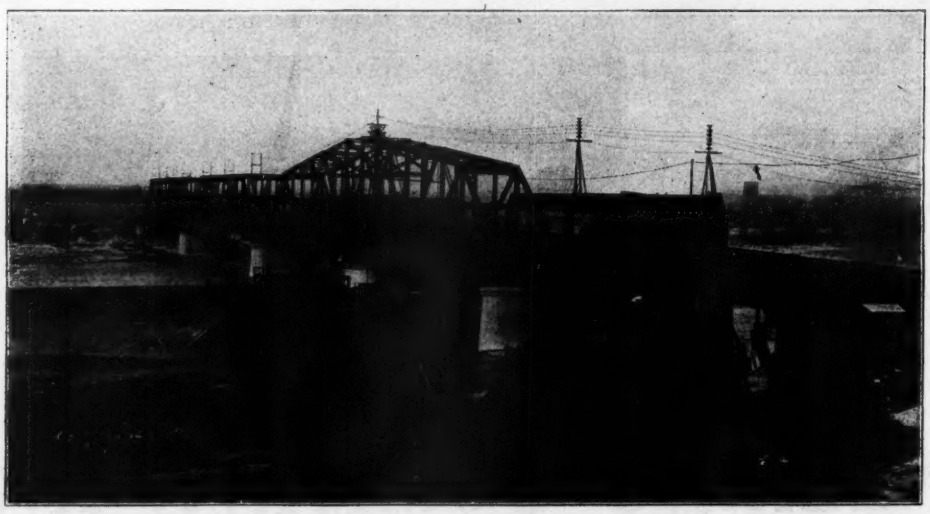
"The Proof of Quality is a Record of Service"



C. B. & Q. R. R. Bridge over Missouri River at Kansas City; highway deck waterproofed by the Minwax System.

MINWAX MINWAX MINWAX MINWAX MINWAX MINWAX

Your Personal Copy

A COPY of the new 148-page Duff catalog, illustrating and describing lifting jacks for every purpose, is now ready for you. It is a complete reference book on jacks of all kinds and sizes.

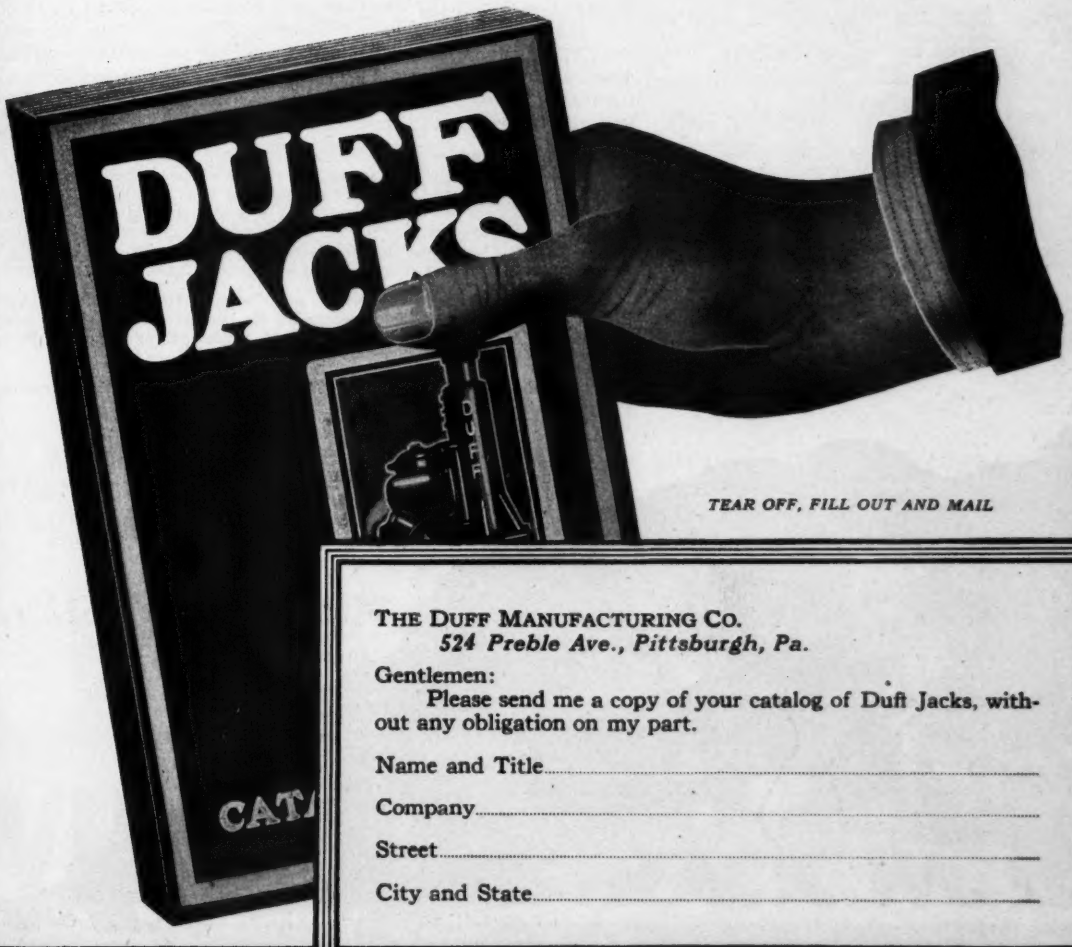
Wherever heavy weights are to be lifted, there is a Duff Jack especially adapted for the work. Whether it is a bridge lifting job or repairing railroad track, there is a special Duff Jack which is most suitable.

Numerous improvements have been made in Duff Jacks to secure greater lifting power with less effort, and many new types have been brought out. You need this new catalog with its complete data and up-to-date information.

We will gladly send you a copy if you say the word. Write us or use the coupon below.

The Duff Manufacturing Co.

General Offices and Works: Pittsburgh



TEAR OFF, FILL OUT AND MAIL

THE DUFF MANUFACTURING CO.
524 Preble Ave., Pittsburgh, Pa.

Gentlemen:

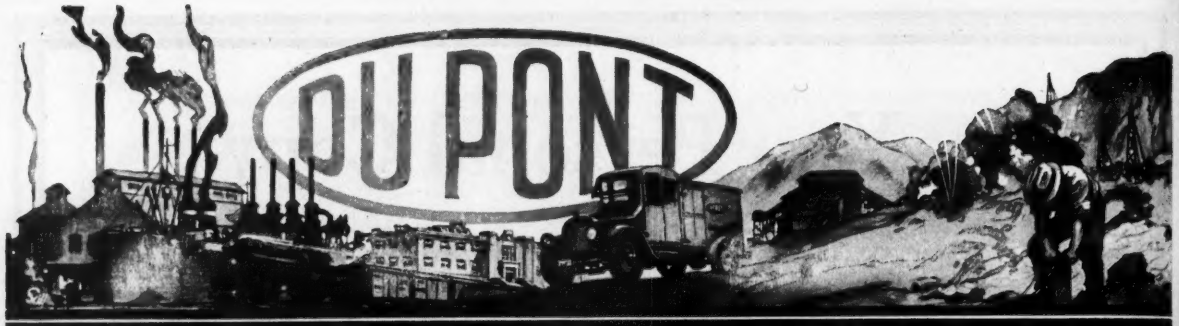
Please send me a copy of your catalog of Duff Jacks, without any obligation on my part.

Name and Title.....

Company.....

Street.....

City and State.....



EXPLOSIVES ~ SERVICE

COMPLETE—

From the Laboratory to the Point where Explosives are used

WE do not consider that our work begins with the manufacture of high-grade explosives and ends with their sale to the user.

Preceding production and progressing with it, come research and experimentation that require the work of over 300 chemical and ballistic engineers. Through their efforts, new and more efficient explosives are being constantly developed, and careful check is kept on every stage of manufacture, insuring that uniform high quality for which Du Pont Explosives have been noted for more than a century.

Their work is supplemented right at the point where explosives are used by a corps of highly trained field representatives whose business is to determine the most efficient and most economical type of explosives for every kind of work under every condition. And it is also their business to assist every user of Du Pont Explosives, whenever it is desired, by applying their specialized knowledge to the customer's particular work with a view to determining the most economical and efficient solution of his problems.

Perhaps these two—the "before" and "after"—features of Du Pont Explosives Service are largely responsible for the present confidence with which users of explosives regard Du Pont Explosives and the Du Pont Company.

Thousands use—and swear by—Du Pont Explosives Service. It is at *your* command as well.

Branch Offices:
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Du Pont Products Exhibit
Atlantic City, N. J.

E. I. du Pont de Nemours & Co., Inc.
***Sales Department,* Explosives Division**
Wilmington, Delaware

WHARTON FROGS, SWITCHES, CROSSINGS

for

Terminals, Main Tracks and Yards

Aeroplane Photograph of the

Richmond Terminal, used by the Richmond, Fredericksburg & Potomac and Atlantic Coast Line Railroads

All frogs and switches for this Terminal were supplied by us. Frogs were of Manganese Steel Railbound Construction and Switches equipped with Wharton-O'Brien Insulated Operating Rods.

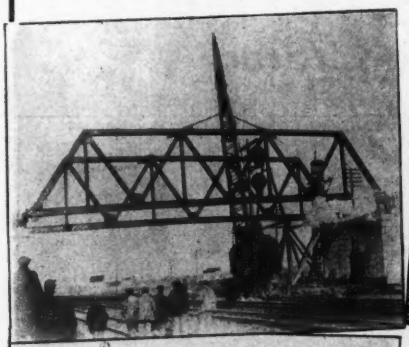
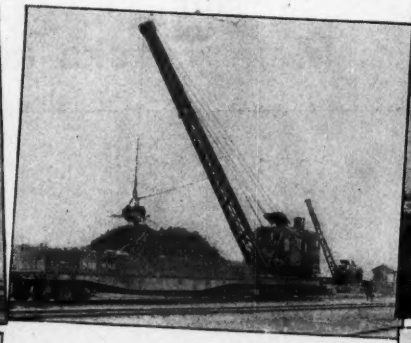
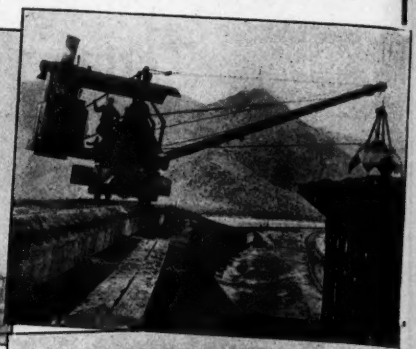
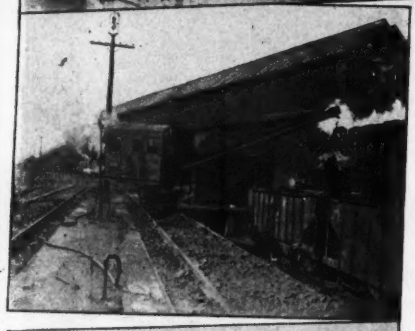
WM. WHARTON JR. & CO., INC., EASTON, PA.

SUBSIDIARY OF TAYLOR-WHARTON IRON & STEEL CO.

OTHER PLANTS { Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Philadelphia Roll & Machine Co., Philadelphia, Pa.
Tioga Steel & Iron Co., Philadelphia, Pa. }

WHARTON Steam, Electric & Industrial TRACK WORK

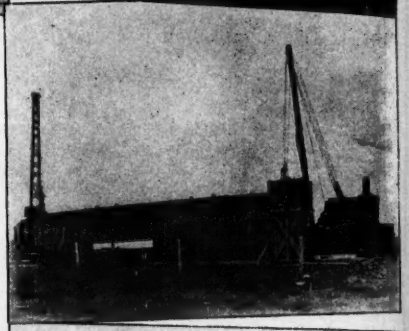
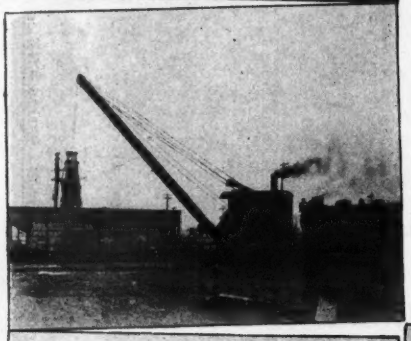
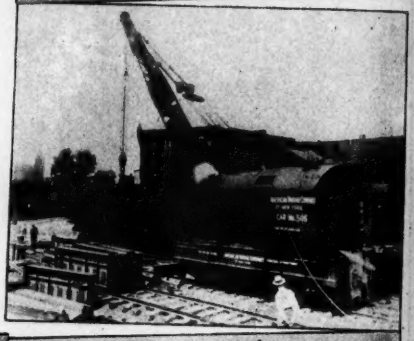
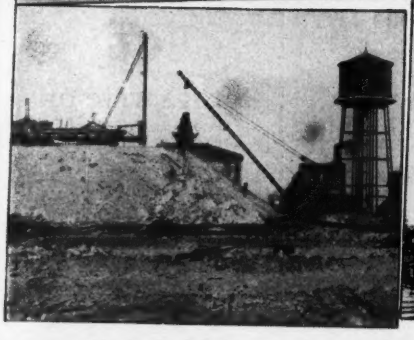
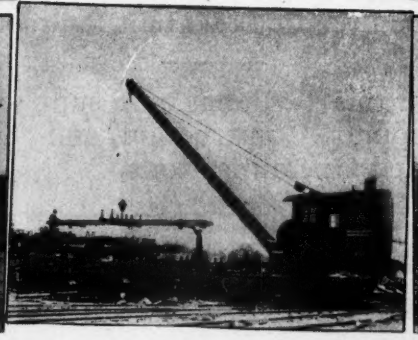
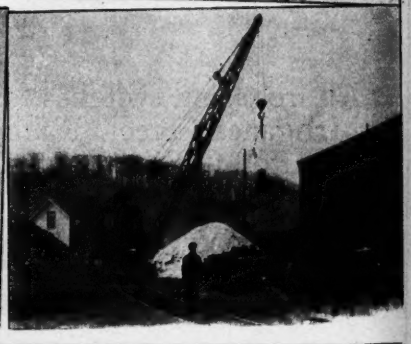
INDUSTRIAL CRANES

An Industrial Crane was once used to put to death, by hanging, an unruly elephant owned by a circus.

The photographs here tell the story of how our machines are engaged daily in every part of the continent on jobs fully as novel and varied.

Two reasons are,—the wide variation in capacities in which they are built, and the inherent versatility of the Industrial Crane itself.

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BAY CITY, MICHIGAN.

NEW YORK 50 Church Street — PHILADELPHIA Widener Bldg. — DETROIT Book Building — CHICAGO McCormick Bldg.

C. B. Davis Engineering Co., Birmingham, Ala.; J. G. Miller, St. Louis, Mo.; F. H. Hopkins & Co., Montreal, Que.; N. B. Livermore & Co., San Francisco, Cal.; Northwestern Equipment Co., Portland, Ore., and Seattle, Wash.

Locomotive, Erection and Wrecking Cranes, 5 to 160 tons capacity. · Pile Drivers, Pillar Cranes, Transfer Cranes, Rail Saws

Member Material Handling Machinery Manufacturers' Association. — *Prompt deliveries can be made on any type of crane.*

BUCYRUS

They were both cut and trimmed in one operation on the Union Pacific by a

BUCYRUS SPREADER PLOW

with a special ditching and shouldering attachment, which is a part of the standard wing.

The Bucyrus Spreader Plow will plow and spread more and stiffer material and work at greater operating ranges than any spreader built. Furthermore, it will build fills to any height in 7 ft. lifts, thus eliminating trestle work. All operations air controlled. It will pay you to investigate.

Send for Bulletin SP-D

Front view of the Bucyrus Spreader Plow in action shouldering and ditching. One trip through gets results like those shown at the top of this page.

BUCYRUS COMPANY

South Milwaukee, Wis., U. S. A.

New York, Chicago, Minneapolis, Birmingham, Cleveland, Denver San Francisco, Portland, Ore., Salt Lake City Pittsburgh, Richmond, Va.

234

SOUTH MILWAUKEE, WISCONSIN, U.S.A.

In Huck Finn's Town Sixteen Years Ago

In Huck Finn's town sixteen years ago the first "AMERICAN" Railroad Ditcher was proving to the maintenance officials of the M. K. & T. Ry., that it could dig more lineal feet of right-of-way ditch for less money than a hand crew of from 40 to 60 men.

Since May, 1905, more than 500 "AMERICAN" Railroad Ditchers have been purchased by the railroads. Most of these were sold on actual comparisons of yardage costs with what the same work had been costing when other agencies were in use. When a man whose ditches, under old methods, were costing him 40 cents a yard saw "AMERICANS" on other lines doing the same work for 12 cents a yard, naturally he wanted an "AMERICAN."

We want your inquiries. An "AMERICAN" representative can reach you in 24 hours.

"Give me where I may stand and I will move the world"

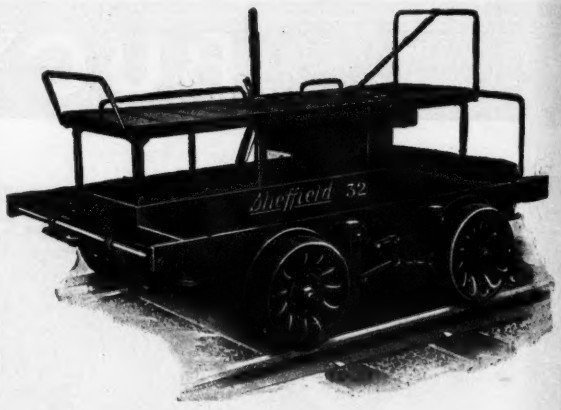
American Hoist & Derrick Co.
Saint Paul Minnesota

Builders of "AMERICAN"

Hoisting Engines	Locomotive Cranes	Sugar Cane Machinery
Electric Hoists	Railroad Ditchers	Marine Deck Machinery and Tackle
Derricks	Logging Equipment	The Genuine "CROSBY" Wire Rope Clip

New York Chicago Pittsburgh Seattle New Orleans Detroit

AMERICAN HOIST & DERRICK CO.



The Car to Fit the Job

FAIRBANKS-MORSE
Sheffield
32
MOTOR CARS

Thousands of Sheffield 32 motor cars are used daily, under all weather conditions—by section crews on railroads in all parts of the world—thus demonstrating the ample power, constant economy, and successful performance of this general purpose car.

The engine is horizontal—two cylinder—air cooled, without valves, cams or sprockets. Drives direct through rear axle which forms engine crankshaft.

Engine is mounted on separate sills independent of main frame and is easily demountable.

Push and pull brakes—positive lubrication. Frame is all steel—plenty of body room for men and tools—wheels pressed steel with forged steel hubs put on under heavy pressure.

Section crews who are provided with this car put in their full day at productive work on tracks and roadbed.

FAIRBANKS-MORSE QUALITY F M 100%

Fairbanks, Morse & Co.
MANUFACTURERS CHICAGO
Oil Engines · Pumps · Electric Motors and Generators · Fairbanks Scales · Railway Appliances · Farm Power Machines

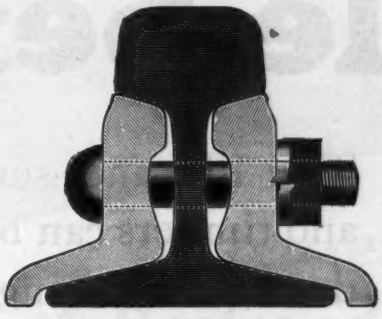
A Winner on 3 Counts

1. **Genuine**
2. Genuine **Positive**
3. Genuine Positive **Lock**

Read it any way you choose, up or down, backwards or forwards, it means the same:

Genuine Positive Lock Washer

GENUINELY POSITIVE



POSITIVELY GENUINE

In plain Railroad English which section men understand, it means the lock washer with the barbs that dig into the nut and face of the fish-plate; a GENUINE sticker that's POSITIVE in its LOCK of the nut to the bolt—it's THE never-loosening medium that holds the rail joints as tight as the day they were assembled—there is no wrong way to apply it; either side up is correct. It is the WASHER that section men want—AND GET.

Made only by

The Positive Lock Washer Company

Manufacturers also of Plain Type Lock Washers

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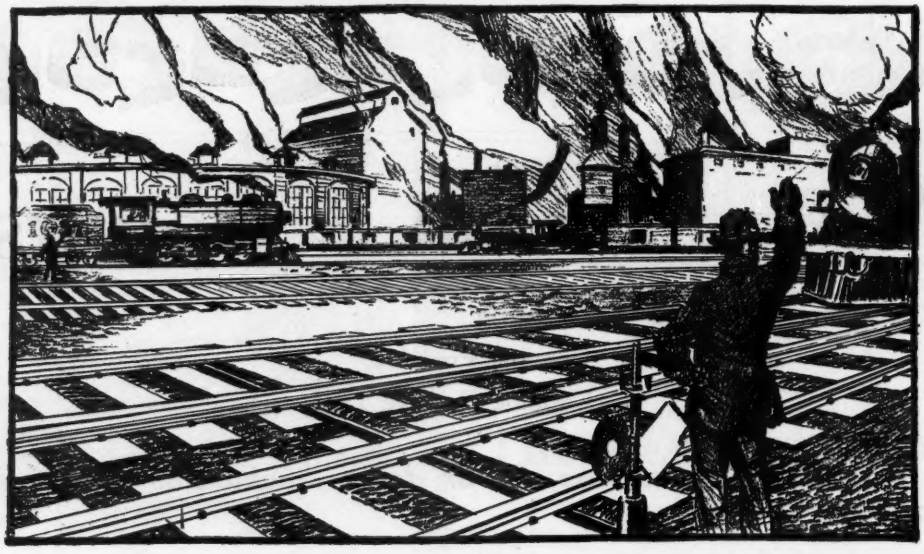

Double Service

REILLY'S IMPROVED PERMANENT CREOSOTE OIL

The World Standard Wood Preservative

The life and service of ties and timbers can be more than doubled by using

REILLY'S IMPROVED PERMANENT CREOSOTE OIL

No tar adulterant to clog the pores and sweat out. No volatile, soluble elements to wash out or evaporate. This pure creosote oil penetrates into the wood and stays in it.

REPUBLIC CREOSOTING COMPANY

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Plants: Indianapolis Minneapolis Mobile Seattle Norfolk

The Improved HIPOWER

Further Increases the Security of Railroad Track Joints

TO maintain our reputation for initiating improvements we are continually on the lookout for opportunities through practical means of increasing the service value of

HIPOWER NUT LOCKS

See Our Latest Development in HIPOWER at National Railway Appliance Show Chicago, March 14-18

For this reason the outer periphery has been chamfered, as outlined in the illustration.

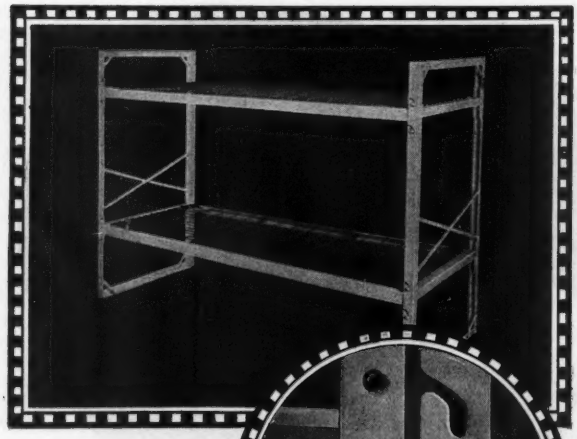
The adoption of a chamfer decreases the possibility of undue strains being imposed upon the outer edges of spiral coils during the process of fabrication and thereby increases their efficiency.

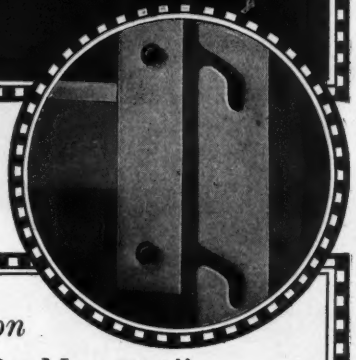
Such improvements, though apparently of trivial importance, when considered in the aggregate are of proven value in still further increasing the security of railroad track joints.

THE NATIONAL LOCK WASHER CO.

Newark, N. J.

New York Chicago Detroit





See the simplicity of the "99" double button system

The Common Sense of the New "99"

IT swept the field last year. The new double-locking button system of the Romelink "99" all-metal bunk does away with the supports and braces—the weakness of the old-style knockdown.

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Nine husky men were crowded on a double-tier Romelink "99" at our shop. There was neither sag nor sidesway, just absolute rigidity.

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It Must Be A Good Motor Car

Theoretically we admit the value of the motor car to the railroad. Practically we have proved it.

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—It Must Be A Good Motor Car

judged from the standpoint of durability and dependability, operating efficiency and low maintenance cost.

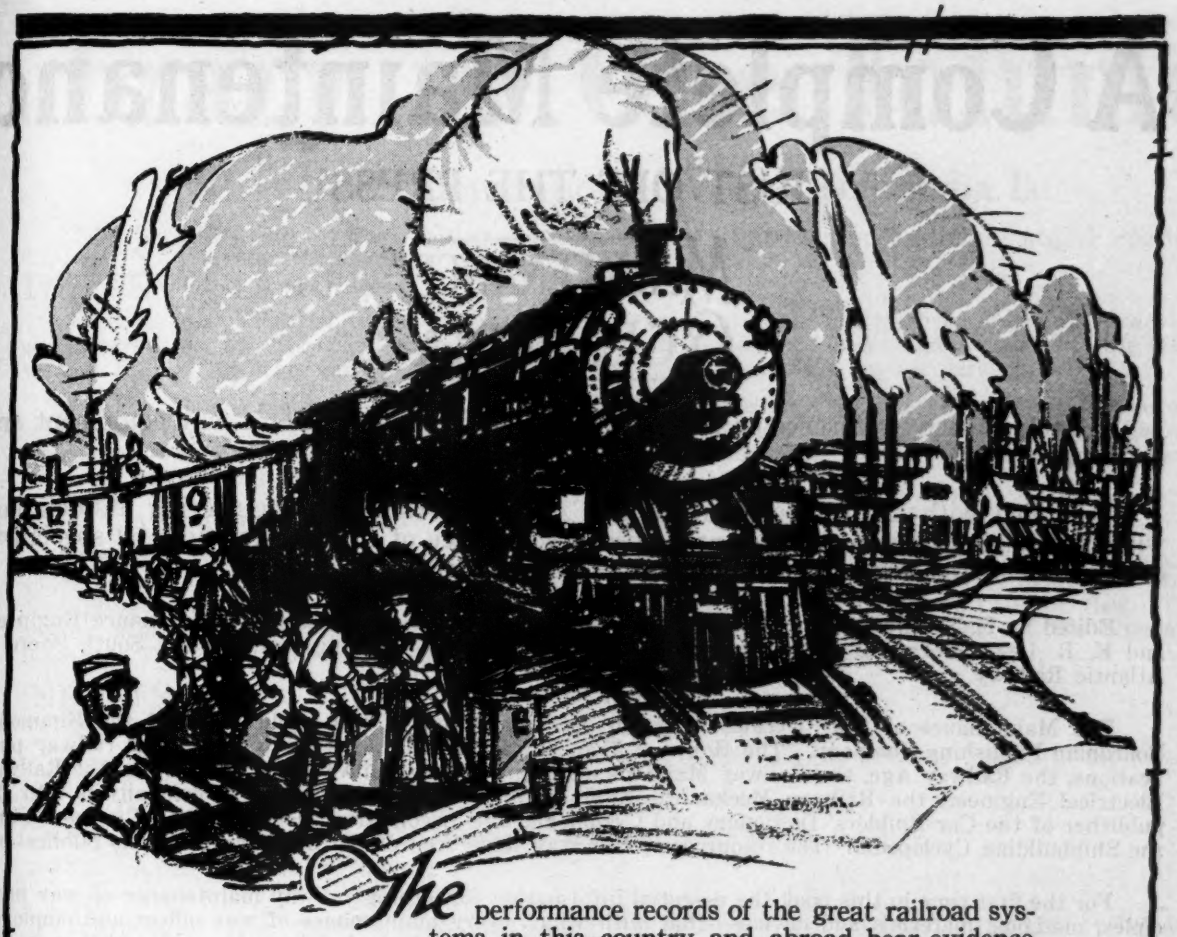
The Fairmont Ball Bearing Motor Car measures up to what constitutes a good motor car.

The thousands of them in service are a daily demonstration of the accuracy of the above statements.

Our Exhibit in the Coliseum will be found in spaces 41-42-43.

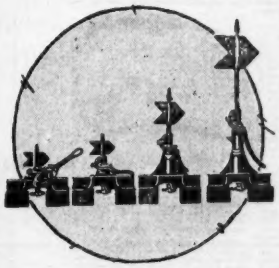
Fairmont Gas Engine & Railway Motor Car Company

FAIRMONT, MINNESOTA



The performance records of the great railroad systems in this country and abroad bear evidence of the progressiveness of those men who shoulder the responsibility of maintenance. On the equipment which they recommend and purchase depends in a large measure their reputation for efficiency and economy. The item of switch stands, for instance, requires their most serious consideration. A switch stand should be durable, positive in operation and always safe.

Ramapo Automatic Safety Switch Stands have come to be recognized as standard permanent equipment wherever installed and they are absolutely safe. The operation by hand lever is simple and positive. When a switch is run through accidentally the stand operates automatically whether locked or not. In either event the target always indicates correctly the position of the switch points. These are exclusively Ramapo features.



Positive throw for hand operation —Automatic throw when switch is run through accidentally.

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HILLBURN, NEW YORK

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SAFETY IN BOTH THEORY AND PRACTICE

Automatic Safety Switch Stands

A Complete Maintenance

JUST OFF THE PRESS

MAINTENANCE OF WAY CYCLOPEDIA

A book of ready reference on all classes of railway maintenance of way equipment and materials.

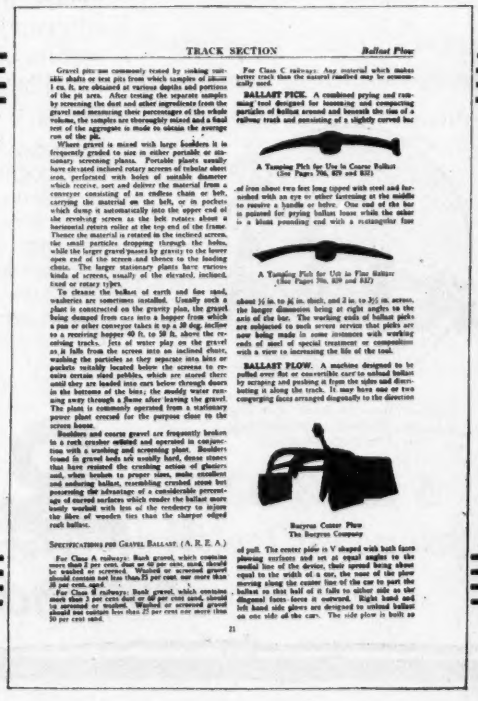
Compiled with the co-operation of The American Railway Engineering Association, with the substantial assistance of an advisory committee of that Association, by specialists on the staff of the Simmons-Boardman Publishing Company.

Edited by E. T. Howson, Western Editor, Railway Age, and Editor, Railway Maintenance Engineer, and E. R. Lewis, formerly Assistant to General Manager and Chief Engineer, Duluth, South Shore & Atlantic Railway.

The Maintenance of Way Cyclopedia is the latest addition to the publications of the Simmons-Boardman Publishing Company, "The House of Transportation." In addition to its regular railway publications, the Railway Age, the Railway Maintenance Engineer, the Railway Signal Engineer, the Railway Electrical Engineer, the Railway Mechanical Engineer and The Boiler Maker, the company is also the publisher of the Car Builders' Dictionary and Cyclopedia, the Locomotive Dictionary and Cyclopedia and the Shipbuilding Cyclopedia. The resources of this staff have been drawn upon freely in this publication.

For the first time in this book the essential information concerning railway maintenance of way principles, methods, materials and devices—that with which every maintenance of way officer and employee should be familiar and much of which has been hitherto unpublished—has been brought together in one volume and arranged in convenient form for ready reference.

860 pages, 2500 illustrations, and numerous insets. Completely indexed.


TRACK SECTION
Ballast Plow
A Tamping Pick for Use in Coarse Ballast
(See Pages 706, 829 and 832)
A Tamping Pick for Use in Fine Ballast
(See Pages 706, 829 and 832)
Bucyrus Center Plow
The Bucyrus Company

Library in One Volume

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The book consists of two principal divisions, the Text Section and the Catalog Section.

THE TEXT SECTION

Presents in alphabetical order definitions, descriptions, illustrations and methods of use of the devices and materials used in the maintenance of railway physical properties. It is as indispensable to the maintenance engineer or other railway officer for reference as to the student for instruction.

For the convenience of the user the Text Section is subdivided into parts corresponding to the several subdivisions of maintenance of way work, including Track, Bridges, Buildings, Water Service, Signals, Wood Preservation, in the order named, and a General Section, including devices and materials in common use in several or all of the preceding sections.

THE CATALOG SECTION

Contains detailed information on specific devices. It is designed to supplement the Text Section, to afford the reader exact details and to help him in the selection of devices best suited to his use. In a descriptive way it treats commercial devices and materials from the railway man's point of view. This section, also, has been prepared by engineering experts of the Service Department of the Simmons-Boardman Publishing Company, with the co-operation of the manufacturers represented.

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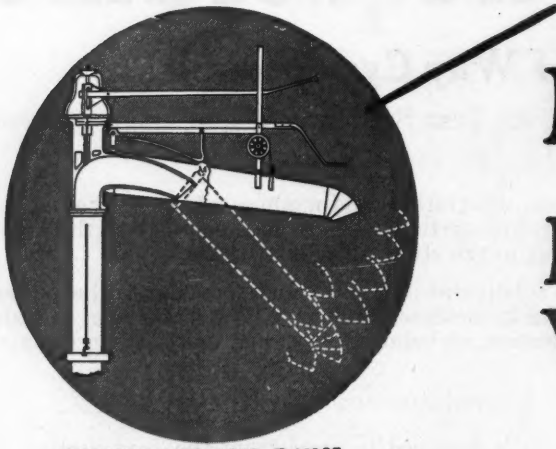

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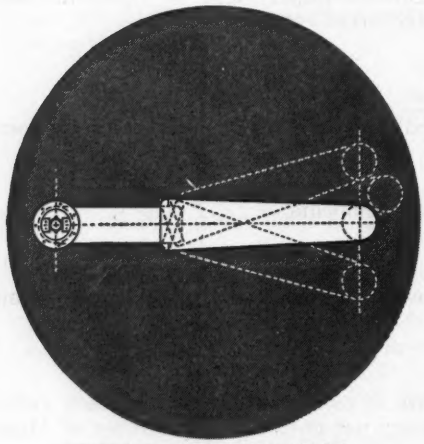
FENNER DROP SPOUT



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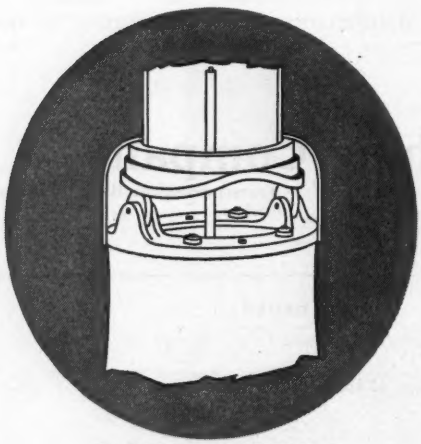

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Its Quicker-Easier-Safer

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POAGE *Style* "H" WATER COLUMN

Equipped with

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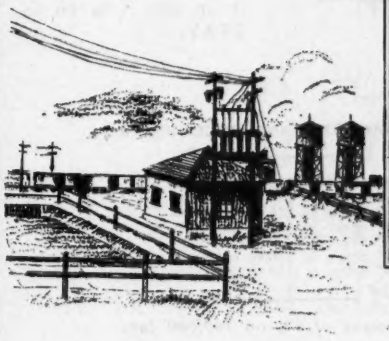

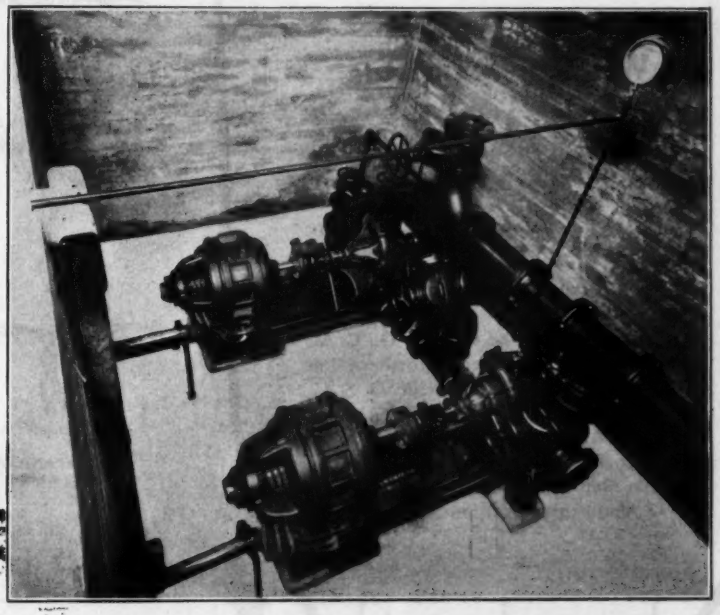

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The pumping station installation pictured above is on the Chicago & Eastern Illinois Railroad at Yard Center, Illinois.

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Provision is made for manual control of the second motor in case of fire, so that it may be operated at the same time the other motor is working on automatic control for fire fighting, one discharging into the suction of the other to deliver about 100 lbs. pressure at the rate of a little over 1,000 gallons per minute for fire service.

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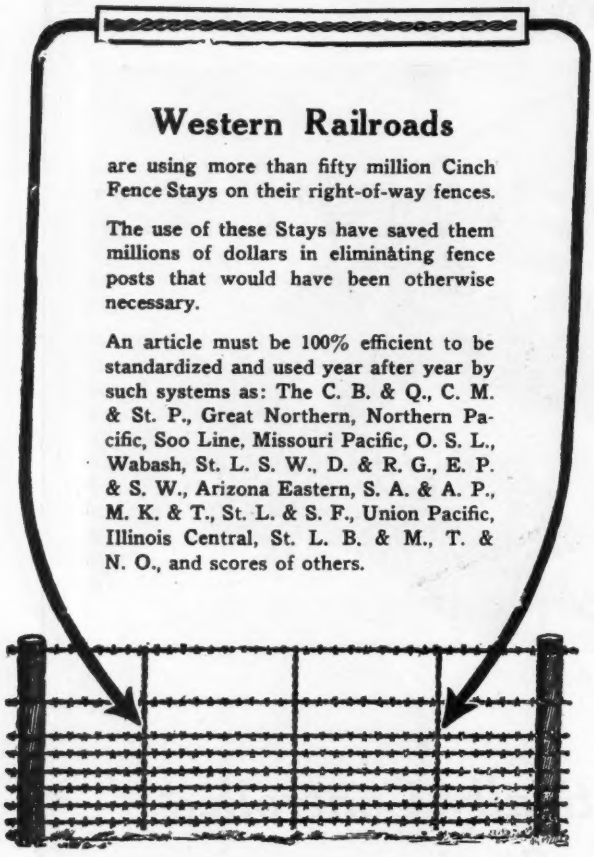

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are using more than fifty million Cinch Fence Stays on their right-of-way fences.

The use of these Stays have saved them millions of dollars in eliminating fence posts that would have been otherwise necessary.

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Long experience has proved that a derailment at a facing point switch where this lock is installed is an impossibility.

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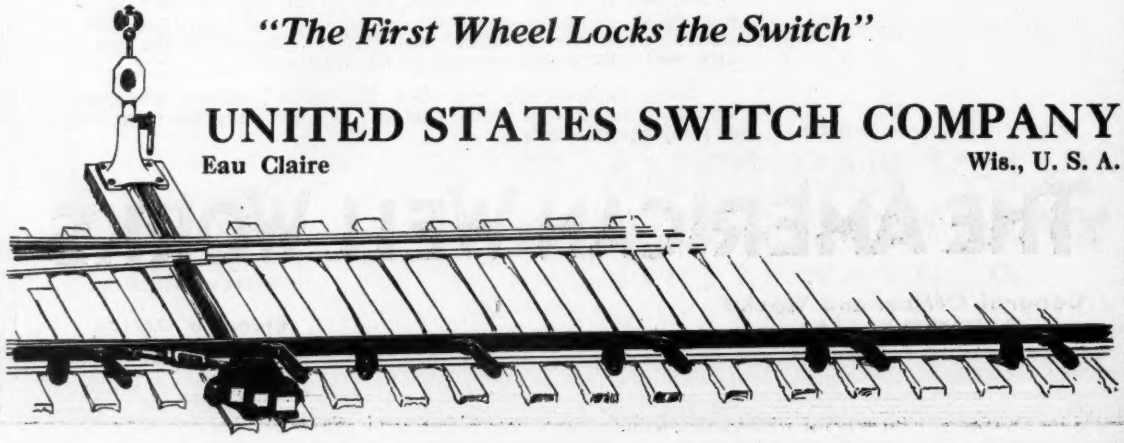

UNITED STATES SWITCH COMPANY
Eau Claire Wis., U. S. A.

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It is a fact that if rail anti-creepers are not applied a large percentage of costs are absorbed in unnecessary expense in maintaining track.

APPLY THE

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Space 122-123 — Coliseum — March 14-17

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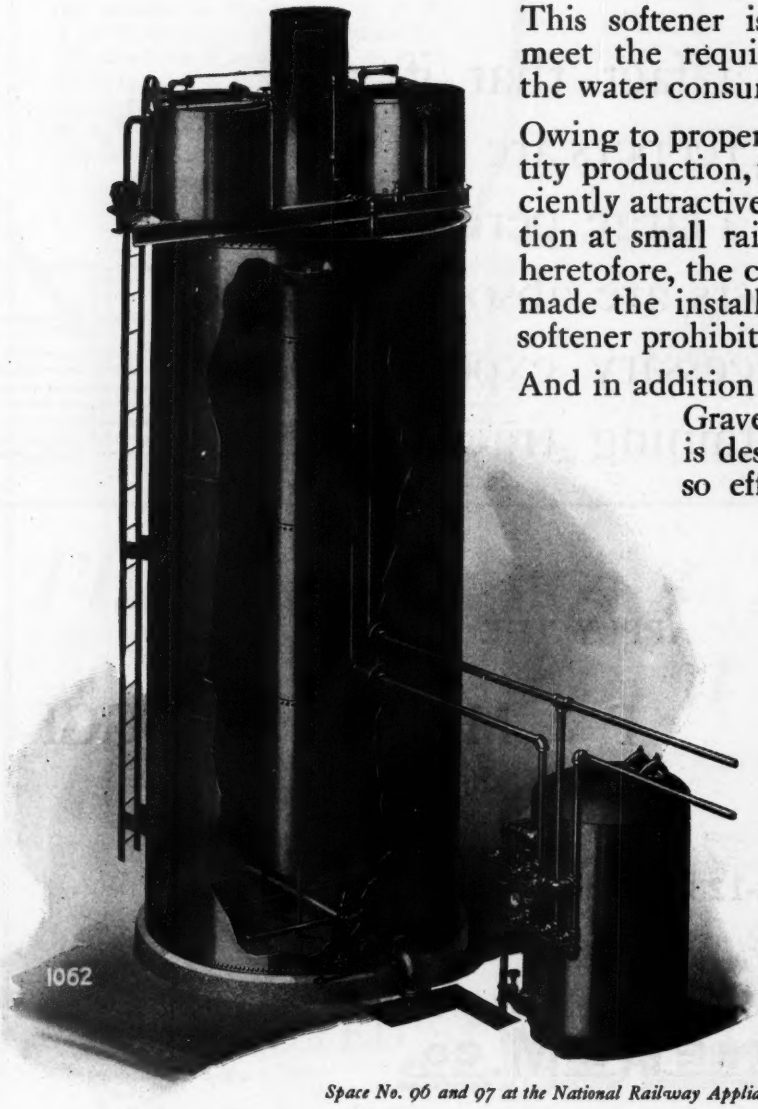
Water
Softening & Purification
HEADQUARTERS

Specially Designed for *Small* Water Stations

GRAVER Small Type "K" Water Softener



This softener is designed particularly to meet the requirements at stations where the water consumption is small.

Owing to proper standardization and quantity production, it can be furnished at sufficiently attractive prices to warrant installation at small railroad water stations where, heretofore, the cost of the usual equipment made the installation of an efficient water softener prohibitive.

And in addition to its low initial price, the Graver small type "K" softener is designed so simply and built so efficiently that it permits a low maintenance cost.

It is shipped with main tank riveted up and downtake in place, making it necessary to simply up-end the main tank on the foundation, place chemical and control tanks in position, make pipe and sewer connec tions and start operation.

Our Bulletin No. 507, together with installation records will be sent to any one interested.

Space No. 96 and 97 at the National Railway Appliance Exhibit.

GRAVER *Corporation*

(2-C)

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Water
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Designed to Serve *All* Water Stations

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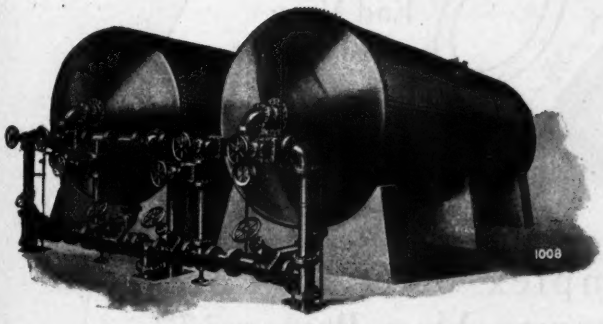

Standard GRAVER Double Unit Horizontal Filter

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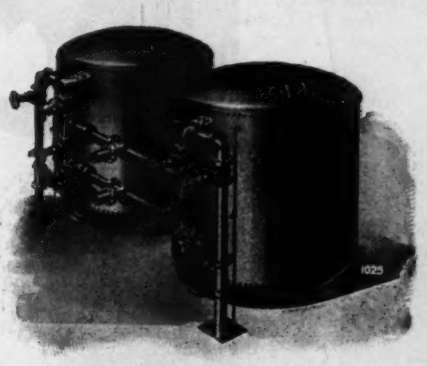
All waters taken from streams carry more or less suspended matter or mud which, besides increasing any foaming tendency, is thrown down as sludge and settles to the portions of the boiler where circulation is least active. If it is not then removed quickly, mud burns will follow, with attendant leaks, buckling of the sheets and letting down of the stay bolts.

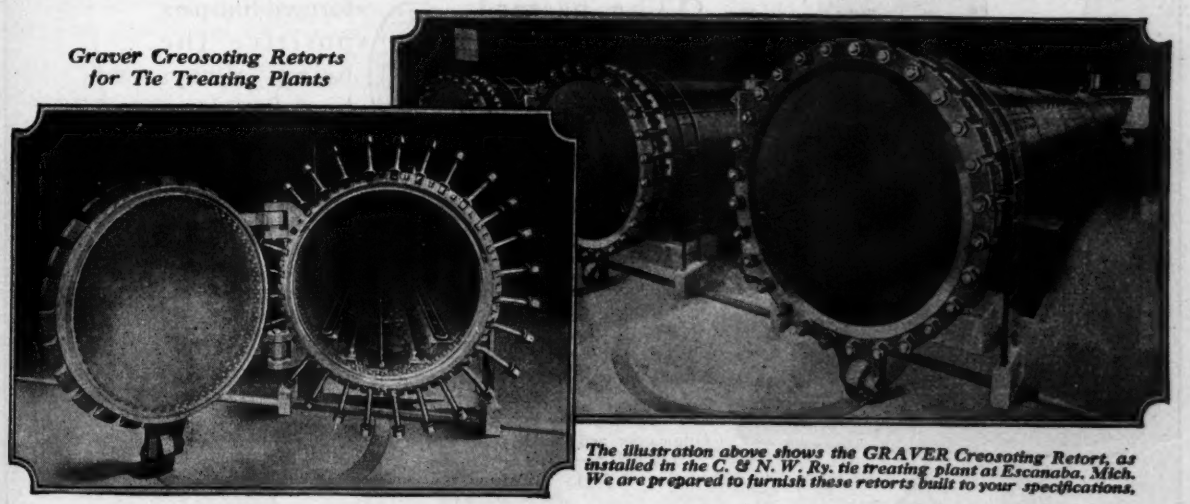
Graver Filters completely remove this suspended matter or mud; and in so doing eliminate entirely the possibility of mud burning and the resulting dangers.

Further details and specifications will be gladly furnished on request.



GRAVER Vertical Pressure Filter

Graver Creosoting Retorts for Tie Treating Plants



The illustration above shows the GRAVER Creosoting Retort, as installed in the C. & N. W. Ry. tie treating plant at Escanaba, Mich. We are prepared to furnish these retorts built to your specifications.

GRAVER *Corporation*

Railroad Department, Steger Building, Chicago

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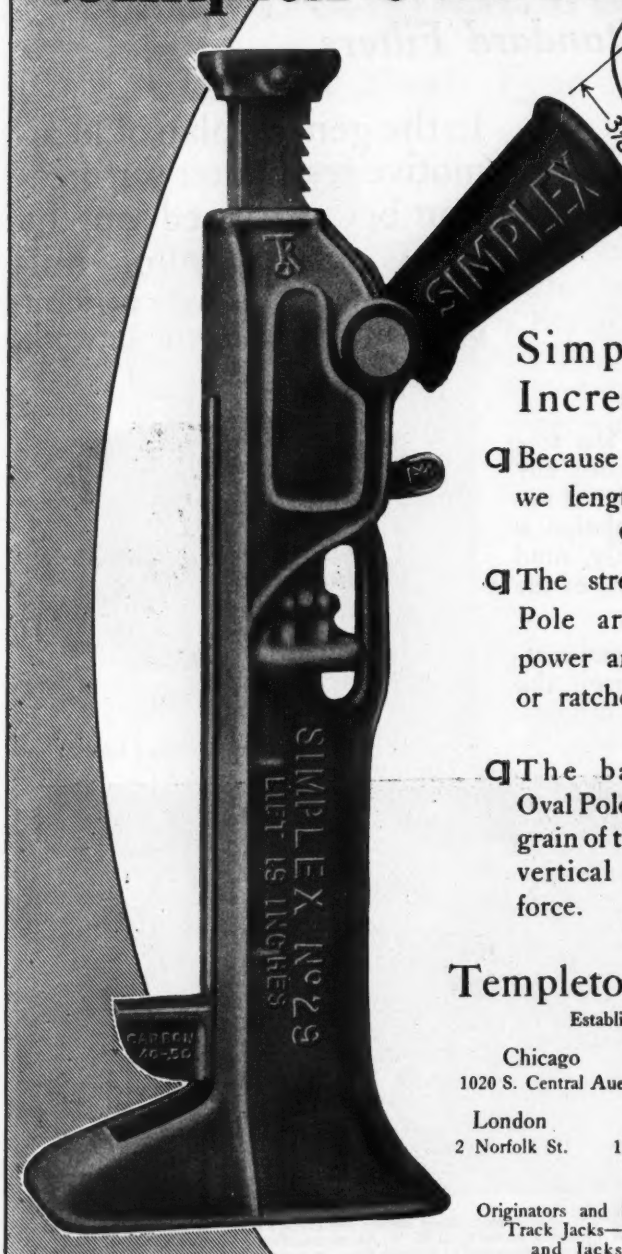

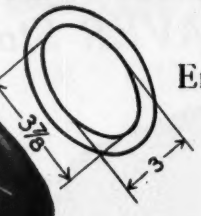

End View of Socket

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(U. S. and Foreign patents pending.)

¶ The strength and safety of the Oval Pole are now in keeping with the power and safety of the modern geared or ratchet types of Simplex Car Jacks.

¶ The bastard Oval Pole makes grain of the Pole vertical to the force.

formed Simplex positive the being always line of strain or

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Simplex Jacks

Railway Maintenance Engineer

Vol. 17 March, 1921 Number 3

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age* and *Railway Engineering and Maintenance of Way.*)

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WE GUARANTEE, that of this issue 7,800 copies were printed; that of these 7,800 copies, 7,122 were mailed to regular paid subscribers, 70 were mailed to advertisers, 35 were mailed to employees and correspondents, and 573 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 23,300, an average of 7,766 copies a month.

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22

CONTENTS

EDITORIALS 79
NEW BOOKS 81
IMPROVING THE LOT OF THE TRACK FORCES 82
A LARGE SLIDE BLOCKS AN IMPORTANT RAILROAD 83
A THROWING DEVICE FOR SLIP SWITCHES; R. M. PHINNEY .. 84
BILL HOLLOWAY'S REVENGE; J. E. A. 85
A CONVENIENT STORAGE ARRANGEMENT FOR GASOLINE 88
TRACK MAINTENANCE IN THE FAR WEST; W. H. KIRKBRIDE. 89
SERVICE RESULTS WITH WESTERN TIE TIMBER; P. R. HICKS. 91
A NEW TYPE OF RIVER BANK PROTECTION; W. C. CURD 93
LABOR BOARD HEARS WAGE CONTROVERSIES 95
A SIMPLIFIED ROOF DESIGN TO PROMOTE ECONOMY 98
THE NATIONAL RAILWAY APPLIANCES EXHIBIT 99
RAILWAY AFFAIRS AT THE NATION'S CAPITAL 101
ANOTHER CHART FOR ESTIMATING TRACK MATERIALS; C. E. PFIFER 102
"PUT IT ON PAPER;" CHARLES H. SMITH 104
ASPHALT MASTIC FOR DECKS AND FLOORS 104
DETERMINING THE COST OF PNEUMATIC TIE TAMPING 105
STUCCO HOUSES FOR TRACK MEN 106
WHAT'S THE ANSWER? 107
LOADING AND UNLOADING TIES ECONOMICALLY 109
ASSOCIATION ACTIVITIES 110
MATERIAL MARKET 111
GENERAL NEWS 112

The March Convention and Exhibit

For the twelfth successive year the National Railway Appliances Association will present its exhibit of engineering, maintenance of way and signaling equipment and materials at the Coliseum, Chicago, on March 14-18, coincident with the annual convention of the American Railway Engineering Association. This exhibit has become an essential part of engineering week, the full value and importance of which is not realized in all quarters because of the fact that it is an annual railway event open to all interested railway men. It is only when the reader contrasts the opportunity which it presents for the study of a wide variety of appliances in a convenient form and in a limited time with the difficulty which would confront him if this exhibit were not held, that he can place a proper value upon it. The March exhibit is an educational opportunity for maintenance of way men not equaled in the railway world. Engineering officers cannot only not afford to miss it themselves, but they should arrange for as many of their subordinates to attend as possible. No supervisor can secure as comprehensive an idea of the equipment and materials available for his use as here. The railways can also well afford to consider the advisability of sending one or more of their more progressive foremen to study the exhibit, for the information which they will secure and take back to their associates will be worth the expense involved. The show will be conducted by seasoned exhibitors under the direction of an association which has had experience with eleven previous exhibits. Consequently all concerned are thoroughly familiar with the railway man's viewpoint.

The Foreman Must Know the Standards

Standards are of little value unless they are put into practical use. This will not be done unless the foreman, the man who actually does the work, knows what the standards are. Standard practices or working methods can be put on record in a book of rules, a copy of which can be supplied to every one of the foremen, but with standards of design or construction the problem is more difficult, especially with the track foreman. A set of blueprints will hardly serve the purpose because, having no suitable place to keep them at the tool house, the foreman will probably take them to his home. The result is that he does not have them with him when he needs them. To overcome this some roads have found it a good plan to give the foreman a set of plans on letter size sheets, bound in loose-leaf form between extra heavy stiff cardboard covers. By equipping these covers with a metal ring by means of which the file may be hung from a nail in the toolhouse, the foreman can have no excuse for not keeping his standard file constantly at hand, while the nature of the file is such that the standard plans may be subjected to severe use without danger of wearing them out. A further development that may well be put into effect is to include this file of standards in the regular complement of the famous outfit which must be accounted for every time that the tool house is inspected.

UNSKILLED LABOR AND ITS WAGE

IN THE hearings before the Railway Labor Board on the question of reducing the rates of pay of unskilled labor, many charges and counter charges have been hurled which have tended to cloud the main issue. Since the larger proportion of that labor classed as unskilled is employed in the maintenance of way department, it is highly important that those in this branch of railway service understand clearly the points involved. While labor is not a commodity, unskilled labor is subject to the same laws of supply and demand as are commodities. Its wages vary with the ebb and flow of industrial activity. In times of prosperity and of corresponding heavy demand for men rates of pay rise, while in periods of depression the reverse is true. The railways must necessarily draw their unskilled labor from this market, paying what the market demands. The rates have varied from season to season and from locality to locality, depending upon this demand. With the advent of federal control, rates were standardized over the entire country and, in keeping with the general shortage of labor, were raised to figures previously unheard of, without recognition of the varying conditions in different parts of the country.

Within the last three months conditions in the labor market have changed radically. The general depression has given rise to widespread unemployment, with the result that wage rates are falling as they have always done in such times. The railways, however, are still subject to the wage scales created in the time of acute labor shortage and are now left in the unusual predicament of paying rates 25 per cent or more in excess of those for which they can secure labor of the same character and efficiency in the open market. This excess which they are forced to pay by governmental orders constitutes a drain of over $250,000 daily, an amount which, while now coming from the owners of the railways, must come ultimately from the public, since this is necessarily the source from which all railway earnings come. It is this drain which the railway managements, who are charged by the new Transportation Act with the economical management of the railway properties, are asking relief from.

This question which has been put up to the Labor Board involves unskilled labor, and that alone, for no consideration is being given to the reduction of wages of skilled labor or of supervisory forces. General Atterbury and other spokesmen of the railways have stated repeatedly before the Labor Board and elsewhere that they have no intention of endeavoring to reduce the wages of other than unskilled labor. The only point to be determined, therefore, is whether the roads shall be required to pay a large premium over the prevailing market price for their unskilled labor. In passing judgment on the issues involved, railway men and others should consider this problem in its true light and not allow it to be confused with other issues.

He Knew When His Work Was Through

"That's not my job, and it's not my care,"
When an extra task he chanced to see;
"That's not my job, and it's not my care,
So I'll pass it by and leave it there."
And the boss who gave him his weekly pay
Lost more than his wages on him that day.

"I'm not supposed to do that," he said;
"That duty belongs to Jim or Fred."
So a little task that was in his way
That he could have handled without delay
Was left unfinished; the way was paved
For a heavy loss that he could have saved.

And time went on and he kept his place
But he never altered his easy pace,
And folks remarked on how well he knew
The line of tasks he was hired to do;
For never once was he known to turn
His hand to things not of his concern.

But there in his foolish rut he stayed
And for all he did he was fairly paid,
But he never was worth a dollar more
Than he got for his toil when the week was o'er;
For he knew too well when his work was through,
And he did all he was hired to do.

If you want to grow in this world, young man,
You must do every day all the work you can;
If you find a task, though it's not your bit,
And it should be done, take care of it!
And you'll never conquer or rise if you
Do only the things you're supposed to do.

—*Selected.*

A TIME FOR SOBER THINKING

WHEN 28 of the largest railroads in the United States, including such prominent lines as the Atlantic Coast Line, the Baltimore & Ohio, the Chicago, Rock Island & Pacific, the Chicago, Milwaukee & St. Paul and the Pennsylvania, fail to earn their taxes and fixed charges during a period of unusually favorable weather conditions a serious situation is indicated. When 36 other large roads, including such lines as the Great Northern, the Central of Georgia, the New Haven, the Northern Pacific and the Reading, fail to earn even their operating expenses there is cause for alarm. This is the situation disclosed by a survey of the returns of the principal roads for the month of January, and nothing has occurred to cause any marked change from this condition up to the present time. It is evident that the present demands a drastic reduction of expenditures. This can be done properly only with the full co-operation of all employees.

Every effort must be made to reduce wastes of every character in the use of materials and no material should be discarded until it has served its full life. However, materials will wear out in service, and most roads have already reached the limit in the reductions in expenditures which can be made in this direction. The greatest opportunity now lies in the curtailment of expenditures for labor, since 60 cents out of every dollar spent by the railways now goes to labor. This result can be secured by reducing the number of men employed, by lowering the rates of pay, and by increasing the efficiency of the men in service.

During federal control the total number of employees increased 261,000. Now, with traffic at a lower ebb than at any time during federal control, it is to be expected that the roads will reduce their forces to the minimum, and probably over 250,000 of these newer men have already been laid off.

Many fears have been expressed by employees that the roads would also undertake to reduce wages. However, with the exception of the unskilled labor, which is discussed editorially elsewhere in this issue, railway

managements are now giving no consideration to the plan for reducing wages. Rather they feel that relief lies in attention to the third alternative—the restoration of the proper degree of efficiency among the forces. If the output of work can be restored to that existing prior to the war, the necessary savings can be made for the present without disturbing the wages of other than unskilled labor. It is with this in mind that the railway managements have asked for the abrogation of the national agreements which have introduced so many restrictions tending to increase the cost of work and to reduce the efficiency of the forces.

The present is a time which calls for the elimination of waste in every line of activity. Any practice which contributes to waste or inefficiency has no place in the present period of reconstruction. Every railway employee who has at heart the interests of his country and of the road from whom he draws his salary will cooperate in eliminating those wastes within his control and in restoring the American railways to that high plane of efficiency which long made them the pattern for the world and the best railways to work for.

THE BIGGEST JOB ON THE ROAD*

SOMEONE has said that "The foreman is the top sergeant of industry." Nothing is more true or important in any industry than this. The character of an organization is up to the character, ability and progressiveness of the foreman. No matter who or what the captain is, the company is practically useless unless the top sergeant is right. If the foreman is a time server, as sometimes he has been taught to be, the men will be time servers also, and the result is well known. Who on a railroad ever gets foremen together to tell them how important their jobs are and to show them that to their men they represent the railroad? Are they encouraged to know the manhood, ability and possibilities of their men? Does the foreman look with his own eyes alone or does he look with the eyes of the management? Does he know his men when off the job? Is he their friend and advisor? When you want something done, do you tell the foreman? Do you explain it and tell him to explain it to his men?

How is a new foreman selected when a foreman leaves? As to the men in the ranks—everything depends upon the foreman. He may be most skilled with his hands and may be most proficient with his own work, but he must know how to manage the most complicated, most delicate machine in the world, a human organization with intricate problems always present. Is he usually told about the management of men and is he helped and supported as he should be in that management? If the new foreman should be made to feel that the employer is his best friend and if he understands the importance of so doing he would, in a short time, pass the feeling along to his men.

Some big successful industries are getting to a point of appreciating what foremen can do and are already building foremen's schools and foremen's meetings to bring these important men to see their own possibilities. The difficulty in finding the right men to develop the schools itself reveals the wonderful possibilities of the plan. Remarkable results are being obtained by leading the foremen to realize that they are really administrators of human affairs, that they require wisdom as well as ability, that an army is what its commander makes it, that the gang reflects the leader and that the leader must know and have the confidence of the men he leads.

*From an address by George Basford before the Western Railway Club, Chicago, on February 21.

NEW BOOKS

The Maintenance of Way Cyclopedia, edited by E. T. Howson and E. R. Lewis. 860 pages, 2500 illustrations. 11½ in. by 8½ in. Bound in cloth and leather. Published by the Simmons-Boardman Publishing Company, Woolworth building, New York City. Price, cloth $10, leather $15.

The character of this book is well indicated by the name it bears since it defines, describes and illustrates in the one volume, the materials and devices employed in the maintenance of railway tracks and structures, together with their applications and methods of use. It is a companion book to the Car Builders' Dictionary and the Locomotive Dictionary which have been issued by the same publisher at intervals for upwards of 30 years. It has been edited in co-operation with the American Railway Engineering Association, with the assistance of a committee of this association appointed for that purpose.

Throughout, the effort has been made to present the subject matter in a form in which it will be of the maximum interest and value alike to the employee directly engaged in maintenance of way work and to the operating or other officer with general supervision over it. As stated in the preface: "The thought has been to select that which is representative of the best in the maintenance of way field, to incorporate the most modern methods, to include those standards bearing the approval of the prominent technical societies and to show those devices which have been proved to be of undoubted value."

A particular effort has been made to present a large amount of maintenance of way information not previously presented in a permanent form and to clear up confusion of terminology as far as possible in this volume, the editors having co-operated with the American Railway Engineering Association and allied technical associations in the adoption and use of preferred terms. In general the nomenclature of the Manual of the American Railway Engineering Association has been accepted. The work of this association was also drawn on in no small measure by incorporating the latest specifications approved by that organization as well as standard plans, etc.

The book is divided into two general sections, editorial and catalog. The treatment of the subject matter in the editorial section has been made compact by grouping in separate sections all of the matter referring to the several phases of the broad subject of maintenance of way. Thus, we find a track section (198 pages), a bridge section (78 pages), a building section (72 pages), a water service section (44 pages), a signal section (118 pages), wood preservation section (20 pages), and a general section (74 pages), each with an independent alphabetical classification of the subject matter covered. The reader will, therefore, naturally turn to the particular section with which he is interested at the time.

The catalog section of 218 pages is designed to supplement the general information in the text section with itemized descriptions and illustrations of specific devices referred to more generally in the text section. Here the reader can supplement the general facts gained from the text pages with specific information concerning the particular line of products he desires to investigate. To insure that the reader will find all matter relating to any subject, a general subject index is given in the front of the volume, giving page references to all sections of the book where the subject is treated in any way. In addition the catalog section is fully indexed by a directory of products, an alphabetical index of manufacturers and a trade-name index.

An Oasis in the Desert—Apartment Bungalow for Employees

IMPROVING THE LOT OF THE TRACK FORCES

Efforts Made by the Southern Pacific to Improve Living Conditions for Employees on Desert Districts

THE LIVING accommodations for section laborers as well as men of more skilled occupations employed by the railroads in the Southwest have been given a great deal of consideration during the past few years. The time was when almost anything would do because most of the laborers came from that class in Mexico which knew very little else in the way of a home except four walls and a roof, with nothing in the way of modern conveniences. Therefore, they did not look for anything better, but these people have come to know the advantages of better living conditions so it has become necessary for the railroads to provide better houses. The ever increasing demands of the government for more sanitary conditions for the people in all walks of life, as reflected in building regulations, etc., have also been a factor in the development of better working and living conditions.

The Southern Pacific has made it a point to give the employees the best to be had regardless of class distinction, to provide living accommodations having proper comforts and conveniences and, in very hot climates, protection from the heat. But the work has not stopped there. Other means have been taken to make life more attractive. In certain parts of the desert country the road has gone so far as to provide schools for the children of employees who would otherwise be denied educational facilities.

In carrying out these ideas the railway has developed what might be termed an apartment house bungalow, generally accommodating eight families. The apartments are grouped on both sides of a wide, high roofed passageway with screened ends. The walls are usually built of hollow tile, making the rooms cool in summer and warm in winter, and with a tile roof these houses present a pleasing appearance. The floors are of concrete. Each family is provided two rooms, a living room 12 ft. by 12 ft. or 12 ft. by 15 ft. and a smaller room for a kitchen.

In localities where the summer heat is not so great a more simple type of house of frame construction is provided. This also has high ceilings, a wide open porch, etc. In some localities concrete is used instead of hollow tile and frame construction, the deciding factors being largely the local conditions, availability of raw materials and other matters affecting the cost. Adobe houses have also been built, as indicated on one of the drawings.

In most cases, especially where more than four families are to be taken care of, a separate wash and toilet building

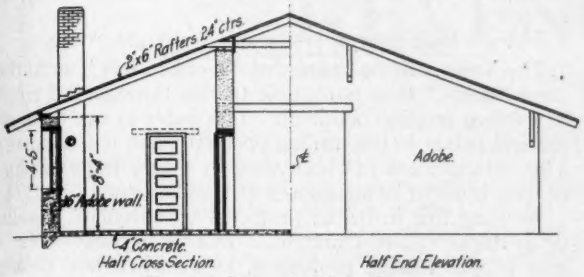
Typical Frame House for Employees

is erected, each family being provided with separate toilet and bath facilities. A community laundry is also provided. Sewerage disposal has been taken care of by a septic tank plant especially designed for each place where the number of persons is too great for the use of cesspools.

Electric lighting is provided where current is available. Windows and doors are designed to give ample light and air and they are also fitted with screens for protection

against flies and other insects. The roofs are well ventilated and in specially hot localities "sun" roofs are built well above the regular roofs.

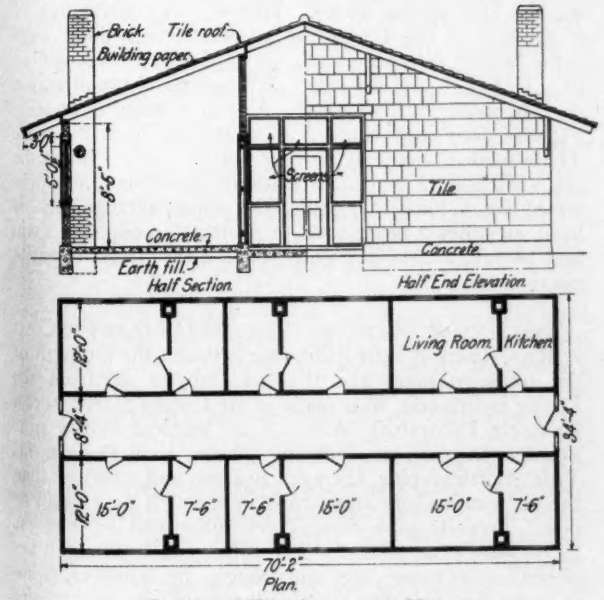
It has been found good practice to provide family accommodations rather than bunk houses for single men, as it encourages permanency of the tenant. However, where bunk houses are erected, they are provided with adequate toilet and bathing facilities and in the case of temporary quarters, where water service is available,



General Plan of Adobe House

portable bath houses are provided, thus making for comfort and cleanliness.

It is, of course, desired that the children of section laborers be afforded school facilities at all times and, therefore, roadmasters are instructed to interchange families from one point to another to allow those having children of school age to be located at places where public schools are available. At certain points where the number of children is sufficient, but the district is without school facilities, the railroad has provided a building for school use and also supplies material in the way of water and fuel, the local school board taking care of the expense of the teacher. At other places a portion of the teacher's salary is paid by the company. At some of these places the railway has arranged to locate double section head-



Details of Tile Apartment House

quarters and in this way insure the presence of enough children to keep the school attendance up to the average number required by the local school boards.

As a further means of making the surroundings attractive, trees and shrubbery are planted at section quarters generally throughout the system; and also on the desert divisions wherever water is available for irrigation, as on these divisions there is insufficient rainfall to sustain plant life. Every encouragement is given employees to plant small garden patches for their own use.

We are indebted to W. H. Kirkbride, engineer of maintenance of way and structures of the Southern Pacific, San Francisco, Cal., for the above information.

A LARGE SLIDE BLOCKS AN IMPORTANT RAILROAD

ON SUNDAY night, January 16, a slide of rock and earth, approximately 6,000 cu. yd., came down on the tracks of the Norfolk & Western, Shenandoah Valley division, between Buchanan, Va., and Solitude, blocking the main track completely and necessitating the detouring of passenger and time freight trains via Lynchburg and the Chesapeake & Ohio. The topography of the ground is of such a nature that the transfer of passengers around the slide could not be accomplished, nor was it practicable to build a "shufly" around it, as the track at this point is on a narrow ledge about 30 ft. above the James river, and the mountain rises at a slope of about 50 deg. to an elevation of from five to twelve hundred feet above the roadbed. This condition extends for several miles.

Scoop cars, ditching machines and labor gangs were dispatched to the site as promptly as they could be assembled and the slide was cleared sufficiently to operate trains over a siding laid around the slide late Monday evening, January 17, which was kept open by the use of shovels and ditchers until Saturday night, when a new break in the mountain developed, resulting in a complete tie-up of this siding around the slide until Sunday evening, when a single train was run by before the track was again blocked until late Monday evening, January 24, although two American ditchers and one steam shovel were kept busy practically day and night. Since that time one of the tracks has been kept open by removing the loose material that had broken and lodged on the mountain, dislodging it no faster than it could be loaded with a steam shovel, to avoid blocking the track. This was accomplished by washing it down with fire hose, water being supplied by a 7-in. by 8-in. pump and a 4-in. pipe line with connections at various points in the line to the top of the break, which was about 300 ft. above track level.

After this loose material was removed sufficiently to enable workmen to work safely on the face of the slide, the placing of a timber crib on a strata of rock and hard-pan was undertaken. This is located about 200 ft. above the track level, where the slope of the slide broke from approximately 60 deg. to about 45 deg. This also was the narrowest place in the slide, it being only about 100 ft. wide.

This crib was designed to be constructed of 10-in. by 10-in. bridge ties and anchored into the solid strata of rock and hard-pan to be erected with a batter of four inches to the foot. The crib consists of three layers of timbers with mitered ends notched and drifted at each connection, three headers being used for each 10-ft. section and laid in arch fashion and well anchored into the side of the mountain at each end. It was filled with material from the slope of the slide from time to time as its construction progressed, thereby guarding against being knocked out by any great mass of earth that might have fallen at one time.

The work of the supervision of the removal of slide and the designing and placing of the crib was in charge of L. C. Ayers, assistant superintendent of the Norfolk division.

A THROWING DEVICE FOR SLIP SWITCHES

BY R. M. PHINNEY
Assistant Signal Engineer, Chicago & North Western, Chicago

DOUBLE slip switches are usually operated and therefore protected by interlocking plants, but there are frequently places of congestion in yards or on main line where slip switches are used before an interlocking plant is installed. At first, solid center frogs were used with one ground lever to operate all the points. These were operated so that, with the lever at one end of the stroke, routes were lined up over the two routes straight across the center frogs; while with the lever in the opposite position, the two diverging routes around the curves were established.

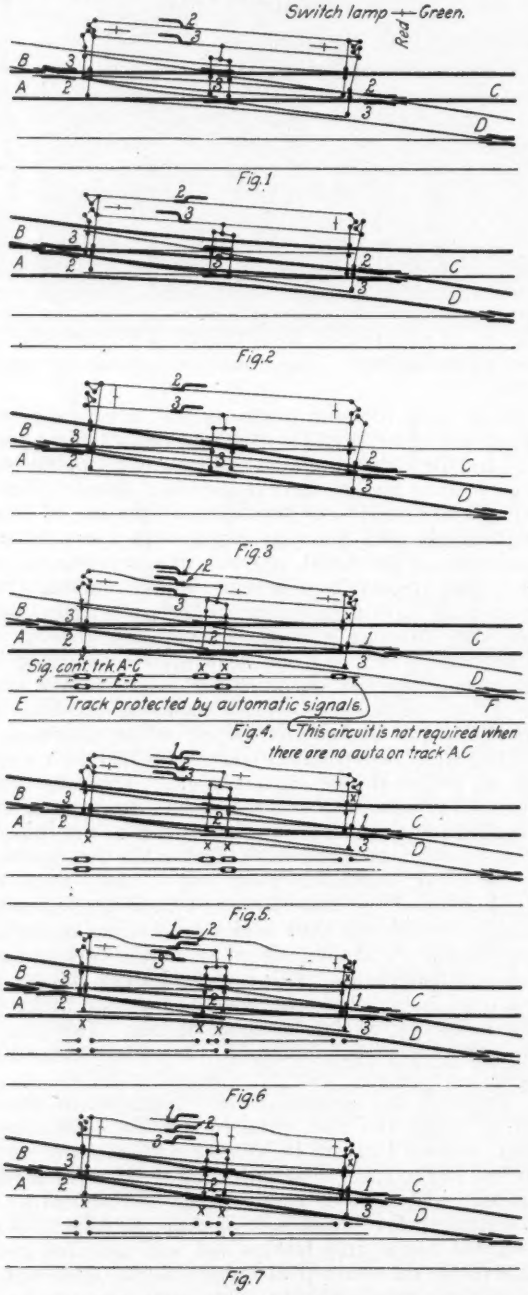


Chart Showing Various Positions in Two Lever and Three Lever Operation of Slip Switches

With the advent of movable joint frogs, necessitated by heavy traffic, it became necessary to protect against derailment at the center movable point frogs, and the two lever arrangement, as shown in figures 1, 2 and 3, was developed. With this arrangement there were three combinations of levers, as follows:

Fig. 1—Both levers normal—one straight route.

Fig. 2—One lever reversed—both routes around the curves.

Fig. 3—Both reversed—the other straight route.

The frogs can be connected to either lever with the same results. It is impossible to run through the frogs in a wrong position, although it is possible to run through the end points in the trailing postiion when not lined up. This arrangement has been used to a very large extent; in fact, it might be considered as standard today.

In using this in tracks protected by automatic signals or in tracks adjacent thereto, it was found impossible to give proper fouling protection, as a switch box cannot be placed on the switch points which protect an adjacent track, as it is thrown with the points at the opposite end to make moves independent of the main line. It is also not possible to carry the fouling track circuit to the clearance point.

In order to obtain this protection a three lever stand was designed. The third lever operates the switch, which does not affect the adjacent track but which is required for a diverging move away from the track to be protected. This leaves the switch at the other end so that a switch box may be connected to it to provide fouling protection for the adjacent track. The operation of the levers is shown clearly in the following figures, 4-5-6-7. As with the two lever stand, it is impossible to run through the frogs in the wrong position, but the end points can be run through in the trailing position.

There resulted an incidental advantage, that of lightening the load on the levers. This is taken advantage of in the first of this type to be installed where there were three located in a yard lead, the yard lead corresponding to *A C*, Fig. 4, and the main yard located in the direction *A*. The main track was *E F*. A large amount of switching was done over route *B C*, diverging from the lead. These were all made by moving switch *1* only. When the slip switch is in one main track of a double track protected by automatic signals, the same arrangement is used, switches *2* being used to protect the opposite main and switch *1* for diverging route away from opposite main.

STRENGTH OF SOUTHERN PINE AND DOUGLAS FIR COMPARED.—There is little difference between the strength of the southern pines and that of Douglas fir from the Pacific Northwest, tests made at the United States Forest Products Laboratory show. True longleaf yellow pine averages heavier, stronger and tougher than Douglas fir. True shortleaf pine averages heavier and tougher than the fir, but is about equal to it in strength as a beam or post. Loblolly pine, though averaging heavier than the fir, is somewhat weaker. The difference in strength between any of these pines and Douglas fir, however, is not so great but that low density pieces of the one species are weaker than the average for the other species.

As far as strength properties are concerned, the choice between any two lots of southern pine and Douglas fir will depend upon the grade and density of the timber composing each lot. The Rocky Mountain type of Douglas fir averages considerably weaker than the Pacific Coast type.

BILL HOLLOWAY'S REVENGE

BY J.E.A

IT WAS no unusual thing for Bill Holloway, section foreman on the Mountain division of the R. T. & O., to linger at the section house long after the day's work was done and his men had gone home. He had been doing this so long that they had ceased to wonder what Bill could possibly find in the lonely little shanty to attract him, but whatever may have been Bill's object in staying there alone, and however much it might have excited comment, no one had ever hung around to gratify their longing to know. Bill Holloway was a man whose energy of purpose and determined traits of character were well known to his men, and the knowledge rather discouraged any tendency to intrude that might exist.

On this particular evening it was no secret to the gang that the boss was by no means in an enviable frame of mind, and after what had transpired that afternoon they knew instinctively that he would never go home until his anger had abated. For with all his peculiarities Bill was never known to greet Marjory, his only child and all that he had left of his family, with anything but a smile and a kiss.

Tonight, after the men had gone, he threw himself down on the grassy bank opposite the section house, with every line of his countenance and figure expressive of the rage that was consuming him. The drawn face, the tightly closed lips, the clenched fists, even the recumbent attitude typical of a panther about to spring, all suggested something of the fury that raged within. Revenge—it was in his heart, on his lips, in every thought and action—revenge from now on would be his controlling purpose.

A thousand injuries he had borne as best he could at the hands of Sam Cummings, roadmaster, and his immediate superior. Usually he had taken in silence the slurs that had been cast upon him by the man who formerly had been his warmest friend, but who now, it seemed, lost no opportunity to humiliate him. Time was, Bill recalled it with bitterness, when they were like brothers. Both had been made foreman from the same gang, and had run adjoining sections. Each had taken a brotherly interest in the other for many years, and it was all the harder for Bill to accustom himself to a change which he had never dreamed could possibly take place. A year before, however, Cummings had been appointed roadmaster in the place of old man Hewett, who had held the position when Sam and Bill were boys together. The selection of Cummings for the vacancy was the first event in the long chain that followed which finally caused the break between them.

According to all established rules, other things being equal, Bill Holloway should have had the position. A year's longer service as foreman, fully as competent in every way, he should have been the logical successor to Hewett. No one knew just why Sam had been chosen in preference to him—no one ever tried to justify it—for Bill was not only a first-class trackman, but he had the respect and confidence of all who knew him. The appointment, deeply as it rankled in his heart, might have been overlooked in time had it not been for Cummings, who, upon getting the position, almost immediately changed his attitude. Never after that was there any intimacy between them—not even an exchange of friendly greetings. No regard whatever did Cummings show for his former friend, but rather a slurring manner was noticeable whenever he spoke to Bill, and oftentimes a sarcastic one as well. At first Bill could not account for it and though he was rough in manner, used to hard knocks and disappointments, yet his friendship once given was deep, sincere and lasting, and thus he grieved over this change more than anyone suspected. As time went on and Cummings continued to misuse him, even at times apparently going out of his way to do so, Bill determined to ignore it all as best he could. He could only figure it out that Cummings, feeling that Bill was really entitled to the position, was trying to get rid of him and thus be relieved of an embarrassing state of affairs. Possibly, too, Cummings feared him, for Bill was, as he well knew, highly respected by many officials whose influence amounted to something.

Only one thing had prevented an open break between the two men—Bill's daughter Marjory, a frail young girl of but eighteen, who had assumed the duties of the home when her mother died three years before. She was the one thing in life that Bill lived for. Were it not for Marjory he would have had it out with Cummings long ago. Uncouth though he was, it was only the best side of him that Marjory was ever permitted to see. He really worshiped her—and she, with a wisdom far beyond her years and experience, knew just how to make him happy, whatever his mood might be. Little by little she had learned about the feeling between her father and his one-time friend. While she could not understand it, she did all in her power to make her father forget the unhappy incidents that were arising more and more frequently; and so Bill had put up with it all for her sake, curbing his passions even when strained to the utmost, but hating Sam Cummings more and more intensely as time went on.

Today, however, it had gone beyond all endurance. Slurs and sarcasm he had borne in silence and to some extent ignored, but when his tormentor insulted him openly it had driven him almost to utter madness, and now, as he lay before the section house mentally acting the scene over and over again, his brain became more and more inflamed. All he could think of was revenge. He must have revenge. He would have revenge. His very body ached for it. Yes, Sam Cummings would be made to suffer for it all; this point was definitely settled and the definiteness with which it was resolved seemed

somehow to preclude the idea of risk. Punish him he would, but in a way that could leave no taint on himself—or Marjory. He would redress his wrongs scientifically. Scientifically—Bill laughed aloud as this idea flashed across his mind. He could do it, he knew that. Just wait, watching for the opportunity that sometime would come, just bide his time, the punishment meted out would not be lessened because of the time he had to wait, rather the reverse. Time would only intensify his hate rather than diminish it. It would be just as sweet when the day of settlement came.

Springing to his feet with a smile on his lips born of hate that so completely possessed him, he quickly locked the section house door, grabbed his dinner pail and started for home. Ordinarily, he had good self-control and even loving Marjory usually failed to detect the passion that often struggled for expression, but tonight, try as he might, he was unable to conceal it from her. She knew something had happened the moment he opened the door, his kiss of greeting, his every word and action betrayed the passion that possessed him, and so the evening meal passed in silence, for her father's manner had a very depressing effect on Marjory. Drawing his chair up to the fire after supper, with head bent forward on his breast, Bill sat in silence until, finding he could not be induced to talk, Marjory retired to her room.

How long he sat there he never knew, but it was long into the night when he finally came to himself and, rising hastily, started for his room. As he passed Marjory's door he paused and glanced in. There by the faint rays of moonlight that streamed in the window he saw a little white-robed figure kneeling by the bed. For a full moment he stood looking at the quiet form of his child and then tiptoed on in silence. That she prayed for him he had always known, and he knew she was praying for him then. Instinctively he felt she had divined something of his feeling tonight, though he believed he had succeeded in keeping the most of it from her. In after years, when he recalled the events that followed in quick succession the following day, he always attributed to Marjory in prayer the night before the determining influence that governed his actions when the supreme test of his character was made.

The next morning he was up bright and early, ate his breakfast in silence and was all impatience when Marjory handed him his pail. The day was cold and cloudy, with a slight mist that promised to develop into rain before night. Hurriedly kissing his daughter good-bye, Bill buttoned up his nor'wester and started for the section house to begin the day of all days and one he never forgot. Little was said among the gang that morning, for the boss' reticence to participate in any conversation soon had a quieting effect on the men. Shortly after three o'clock in the afternoon Jim Cross, who had been delegated to walk the section that day, came up to the gang and reported that a heretofore unknown stream of water had developed since the day before on the mountain side a mile up the grade and that it was rapidly eating a bad hole out of the big fill at that point.

"Nothin' much alarming right now," Jim said, "but she oughta be looked after by t'morrow, anyway." A little fearful of the unusually quiet Bill, he hesitated a moment and then, with a glance at the skies, added: "It wouldn't hurt none to look at her now." By this time the mist of the morning had begun to assume the proportions of a drizzle, while the fitful gusts of wind threatened a regular "northwester." Bill, somewhat apprehensive of heavy rains during the night, with a possible disastrous washout if the new stream was not looked into, decided to investigate it himself before going home. Leaving his men to finish their work alone, he started up the track. He was a fast walker and soon came to the point where the water was cutting into the fill. It was certainly making itself felt, for already a large amount had been washed out. Determined to prevent, if possible, any further damage that night, he started tracing the stream up the mountain to its source, and after walking through the woods for about a mile came to the cause of all the trouble. As he suspected, a brook that had always flowed down its regular channel toward the railroad and then through a culvert, under the fill, had been diverted by a huge boulder that had become loosened some distance above and rolled down until it had found a rather insecure lodgment squarely in the center of the narrow little stream. Limbs of trees and other debris had gradually accumulated until the water had been completely dammed up, only to overflow at another point upstream, where it quickly cut a new course down the mountain side. Taking in the situation at a glance, he looked about him for a limb large enough to use as a lever to pry loose the debris and the rock from its unstable position, but it was some time before he succeeded in accomplishing his task. As he finished his work he suddenly realized it was nearly dark and that there was nearly three miles between him and home, all in the face of a rapidly approaching storm, which to Bill's experienced eye promised to be a record breaker.

Hastily putting on his coat, he started down the mountain toward the nearest point on his section, preferring to walk the track than to short-cut through the woods, with the chance of being hit with a falling limb or tree which the high wind made very possible. He soon reached the track and paused a moment to get his bearings before setting out for home. Dark as it was by now, he had no sooner peered up the track than he became aware that something was wrong. A quick succession of glances around him failed to reveal anything out of the ordinary, but still the feeling remained. Not over a hundred yards from where he stood there was a spur that he had put in a year before for the purpose of loading wood and bark from the mountain side. It was to the spur that his glances seemed to be unconsciously drawn, and as he strained his eyes in that direction he finally made out a deeper shadow in the darkness—the faint outline of a big bark rack that had been put in to load—*and it was foul of the main line*. As this knowledge flashed upon him his heart sank. In another moment he was at the car. Evidently the crew that put it in had not set the brakes as tight as they should have been and the high wind blowing down the mountain had slowly but surely worked the car out little by little until now it did not clear.

By the aid of his pocket flashlight which he always carried, he looked at his watch and found that No. 34, the southbound local, was due at Ramey, two miles below, in just twenty minutes; but No. 33, the northbound, was due at Summit, four miles above, in about thirty minutes, and "33" was more often on time than "34." What should he do? No! What could he do? That was the question. There he was, fully two miles from help of any kind in a storm threatening to break into a tempest at any moment. He leaned up against the bark rack with a feeling of helplessness—not a torpedo, not a fusee, nothing but his little flashlight, and he well knew what little chance he had of stopping either one if it really began to rain. Suddenly he remembered the telephone station the company had installed the month before, not over a hundred yards below the spur. With a surge of relief he dashed down the track toward the little octagon building that housed the phone. Jerking down

the receiver, he started to call the despatcher, when he became aware of a conversation that was being held by the very man he wanted to talk to and the operator at Leighton Junction, four miles below Ramey. Bill was about to break in on this when the full import of what he was hearing came upon him. "You will hold the general manager's special at Leighton," the despatcher said, "for train 33, as Roadmaster Cummings is about to leave Summit now in his speeder for Leighton, where the general manager's special will wait for him." Bill tried to still the beating of his heart, which was thumping like a trip hammer. Cummings—the man he hated—on his speeder, and on such a night as this. Again he listened. "Cummings will start out of Summit ahead of '34,' which is twently minutes late," he heard the despatcher say; "says he can make Leighton Junction in fifteen minutes," went on the despatcher, "and I guess he will, considering the way he generally runs his new motor car."

"I'll bet a hundred he won't tonight," flashed through Bill's mind. He waited to hear no more. Softly he hung up the receiver, gently he closed the door. Every thought for the safety of the trains that had so completely possessed him a moment before now was subordinated to the stronger one of revenge. As the knowledge grew upon him that at last Cummings was in his power it overwhelmed him. Great beads of perspiration stood out on his forehead—he fairly shook with exultation. "'All things come to him who waits,' I'll tell the world," he muttered with a laugh of triumph, "I can swear to that," as he again walked quickly back to the spur. He chuckled to himself in savage glee as he made certain that the speeder could not possibly clear the bark rack. There could be no mistake about what would follow—the hour had come at last when the desire of his life would be fulfilled.

"It'll be scientific, too," he mused, for by no manner of means could he be associated with or suspected of having a hand in it. For a moment he stood there picturing to himself just what would happen when Cummings went into the side of the bark rack at a thirty-mile-an-hour clip. "He'll sure be going that fast," he calculated to himself, "and when he hits, well, that speeder'll carom off that car like a billiard ball," and Bill drew out his flashlight and peered down the bank opposite the spur where a gorge of rock lay fully twenty feet below. "No chance for a miss," he gloated, "it's a sure go. Well, why not?" he almost yelled, as he recalled the countless indignities at the hands of Cummings. "He deserves all he is going to get," and he turned back preparatory to taking his own departure before the tragedy occurred. Should he walk the track? No, he thought best to take a chance now in finding his way through the woods. Somehow the desire took possession of him to get just as far away from the track as he could. He didn't want to see or hear anything that would remind him of what was soon to take place. With a last look at the bark rack he started to climb the stone wall that separated the road from the woods when he suddenly thought of "34" that was to follow Cummings down from Summit.

He stopped aghast as he visualized what would happen when the train, running at full speed making up time, collided with the car. In his eagerness to see that nothing prevented the death of Cummings, he had entirely overlooked the greater tragedy that was bound to follow the first one. For the first time the enormity of the crime he was about to commit squarely confronted him. He sank down on the wall torn with conflicting emotions. Must he lose this one big opportunity he had planned for so long? He would never get another like it. But on the other hand, the knowledge that he, and he alone, would be responsible for the fate of "34," with its load of human freight, many of whom he knew were his friends, would not be put down. True, no one would know his secret, he was safe, but—he winced as he thought of it—knowing his own guilt, could he ever be the same Bill again? Could he meet friends and loved ones of those he had sent to eternity and not show his guilt? How could he keep such a secret from Marjory? As he thought of his daughter for the first time, and recalled her as he had seen her the night before in earnest prayer for him, he shook his head. He might keep it from the other people—but from Marjory, never.

Crouching there on the wall, oblivious to the howling tempest about to break, Bill Holloway realized the turning point of his life was reached. On his decision hung the fate of many, including his own and—Marjory's. As he peered into darkness on the opposite side of the wall it seemed as if he could see her looking at him in mute appeal. His head came up—his decision was made. With a bound he reached the track and the next instant was past the spur, racing like mad toward Summit. Would he be able to stop Cummings? That was the big thought uppermost in his mind now. He knew Sam was a daredevil on a motor car; that he would be running at high speed tonight went without saying. No such thing as Cummings going slow, and what made it worse, in the teeth of such a storm, he would be looking up only occasionally, and the fear that he might fail to see made Bill redouble his efforts to cover as much ground as he could before Cummings hove in sight.

Revenge had left his heart now—his duty was plain. Almost exhausted he sank down and listened with his ear to the rail. He could hear a faint hum that told him the speeder was coming. Leaping to his feet, he rushed onward again in the direction from which it would come. In another moment he saw the light on the front of the motor as it rounded the curve. Standing squarely in the middle of the track, Bill began waving his little flashlight. No answering signal from Cummings, and as Bill began to hear the hum of the motor, which gave him some idea of the speed it was making, his hope began to die.

On it came. In despair Bill braced himself for a final effort. Reaching down, he scraped up a handful of gravel with which the track was ballasted, and with this ready to hurl at the on-rushing motor car, he again waved his flashlight. There was no response from Cummings. Waiting until the last second before he left the center of the track, he jumped to one side and, as the car came opposite to where he stood, threw the gravel with all his might, supplementing this with the loudest yell it was in him to make. A quick shut-off of the motor and the application of brakes indicated that Cummings had seen him. A moment or two later Bill caught up to him.

"What the D——l are you doing here?" was the greeting he got from Cummings, as he recognized who had flagged him.

"Shut up," gritted Bill, as he climbed on the speeder, his eyes flashing, "you'll know in a minute, and be damn glad I was here—run her down to the spur." Without a word further Cummings complied. As he took in the situation he turned, reached into the motor car and pulled out a pinch bar.

"Good thing I always carry one," he said tersely; "let off the brake, Bill, and I'll pinch her back to clear." The job was quickly done and together they mounted the car in silence. It was not until Cummings slowed down at Ramey to let Bill off that he spoke. Then, turning around,

he extended his hand. "Old Timer," he said huskily, "can you forgive me?" Holloway stepped off the car, hesitated, then slowly put out his hand. In another moment Cummings was gone and Bill started for home with a stranger feeling tugging at his breast than he had ever known before.

As he neared his house he saw Marjory, with her face pressed against the window pane, peering out into the darkness. She met him at the door with wide-open, frightened eyes. "Daddy," she exclaimed, "I'm so glad you have come—you don't know how I've been worried." Bill recalled the vision he had of her back on the mountain and looked at her suspiciously.

"Where have you been Marjory?" he asked abruptly, "why should you worry about me?" looking at her closely.

"Why," she hesitated, "you were so late, Daddy," and then continued, "I got so tired of waiting that I fell asleep in the chair and dreamed"—breaking off with a shudder. "Have you been in danger?" she suddenly asked.

"Yes," he answered, "the worst I was ever in, I guess," and then not feeling like telling about it, added, as he swiftly bent down and kissed her, "forget it, Honey; I'm here now and everything's all right."

The next day the story of Bill Holloway's exploit was all up and down from one end of the line to the other. A long account of it had been given out by Cummings on his arrival at Leighton Junction, and the newspapers were making much of it. Bill, who was naturally of a modest disposition when it came to publicity, suddenly found himself famous. One day a week later he received a message to report at the general roadmaster's office on the following day. Not knowing the reason for the summons, he, of course, associated it with his recent exploit, and it was with some degree of embarrassment that he entered the office on his arrival. He was warmly greeted by the general roadmaster and also by Cummings, who was present.

"Holloway," began his chief, after complimenting him on his achievement, "we are going to take over some new lines that will greatly increase my duties and I shall need some assistance. Mr. Cummings has been appointed assistant general roadmaster, effective today, and his recommendation that you be appointed division roadmaster in his place meets with my hearty approval. What do you say?"

Bill stood speechless. "It's all right, Old Timer," said Cummings huskily, "you deserve it if any man ever did and what is more, you can fill the bill." Bill started once or twice to say something, but when Cummings pressed two little pieces of cardboard into his hands, one an annual pass for himself, and the other, one for Marjory, he got stalled, as he afterward explained—just couldn't move either way, try his best.

It was late that night after his return home, when the supper dishes had been cleared away, that he called Marjory and told her what had happened. She listened very quietly until he was though, then, lifting her face to his, she looked him full in the eyes. "Daddy," she said, "I'm awfully glad, but I am more glad you did what was right that night when you—when you stopped Mr. Cummings."

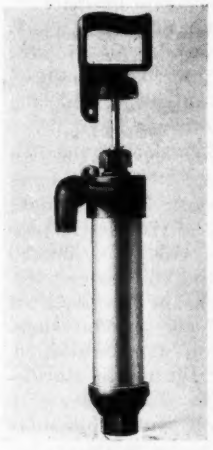
Bill's heart stood still. Had she divined what had passed through his mind that night? Did she suspect the terrible struggle he had had with himself? Something told him she did. His late arrival, his reluctance to tell her anything of that evening, the newspaper accounts she had read, and finally, her intimate knowledge of his traits of character would enable her to visualize clearly the temptation to which he had been exposed.

"Daddy," she said again, this time with her face very close to his, "I'm awfully glad."

For a moment he was silent, and then, drawing her closer, he whispered, "So am I, Honey. It always pays to be on the square."

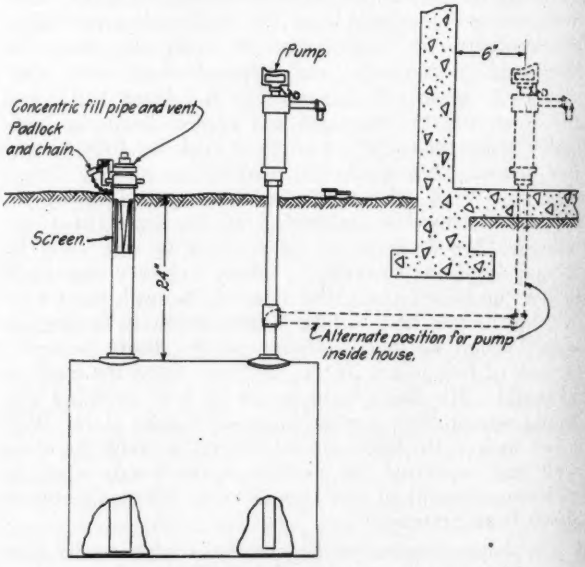
A CONVENIENT STORAGE ARRANGEMENT FOR GASOLINE

SAFE YET convenient storage of gasolene and other fuel oils in the limited quantities normally provided for motor cars is a problem imposed on the maintenance of way department with each assignment of this equipment. Therefore, it is of interest to note that the St. Louis Pump & Equipment Company has developed a small storage outfit which is being manufactured in capacities ranging from 70 to 290 gal. for use by the railroads. The elimination of drums and other shipping containers or receptacles means the elimination of fire hazard and loss in quality and quantity of oil through evaporation, leakage, spilling, etc. These storage outfits consist of an underground tank with a concentric filling pipe and vent and an outlet pipe equipped with the type of pump shown in the illustration. This pump consists of a seamless brass cylinder with a brass plunger and weatherproof housing over the stuffing box. The handle is arranged to be secured by a padlock. A second padlock is provided to control the inlet pipe.



The Pump

The storage tanks, which are made of 14-gage galvanized steel, are normally buried 24 in. below the ground level with the inlet pipe and pump placed directly above the tank. However, with additional piping it is possible to bury the tank outside and install the pump inside an adjacent building, the entire equipment being complete with the exception of the horizontal pipe, which will be of variable length, depending upon the distance from the tank to the building.



The Storage Outfit Complete

TRACK MAINTENANCE IN THE FAR WEST*

Many of the Problems on the Coast and in the Mountains Are Peculiar to That Region

BY W. H. KIRKBRIDE

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ENGINEERS have known since the earliest days that earth, when dry, will stand on a 1½ to 1 slope. However, if this material should be moistened with water it will take a flatter slope, if more water is added a still flatter slope, and we can readily imagine the extreme condition of saturation where a fill is flattened down and becomes mud, not capable of sustaining an individual, much less a railroad train. This has an important bearing on one of the basic and most important rules in good track maintenance—good drainage. It needs no further argument to show that water must be kept away from the railroad embankment. We accomplish this by the construction of culverts, surface ditches above cuts and side ditches in cuts. The objective is to intercept the water before it gets to the track and keep it going. However, in spite of the greatest efforts, water does get on and in track. The embankments and cuts, if properly formed, shed rain water away from the track section, but the natural tendency of the ballast and ties under pounding action of trains, and the constant tamping by the section forces endeavoring to maintain surface, is to go downward, thus forming a trough or depression in the center of the roadbed. This depression, together with porous ballast, affords an opportunity for water to collect.

The section foreman is obligated to maintain the shoulder of the fill to grade, and the material so used generally comes from the ditches in the adjacent cuts, and usually is of a clay or non-porous formation which still further seals the water into the center. Furthermore, on a new railroad the embankment naturally settles, but through it all the track must be kept to grade by the constant re-application of more ballast, and in time a pocket, several feet in depth, is formed. During the severity of winter (on the west coast) these pockets fill up with water, the embankments having also lost their natural cohesion of the particles by excessive rainfall. The hydraulic pressure thus created breaks off the side of the fill, creating a problem difficult to handle, particularly while the rain continues to fall. Crushed rock ballast, having a large percentage of voids, particularly offers an opportunity for the creation of such water pockets. I have seen banks break away from the track, exposing pockets 12 ft. wide below the tie, which would run water in a considerable stream for a 24-hr. period. The only remedy is to surface the track for a year or so with a dense or voidless material, such as decomposed granite, thus creating a waterproof cover on top of the embankment.

It is also necessary about every rail length to dig trenches into the sides of embankment and fill them with porous material, such as slag or cinders. Of course, the proper thing to do is to prevent these pockets in the first place by using a ballast material such as decomposed granite; if this is not available, the next best thing is gravel. The shoulders of embankments, as they settle, should always be raised with a porous material. I also wish to remind one that many a job of rock ballasting is spoiled by first building up banks with dirt against the old ballast, then wasting the ballast from between the ties on the outside of this new material, and then making a track raise on the crushed rock. What should be done is to keep the bank widening material down to the old sub-grade, using the old ballast for the topping, or as a sub-grade to the new ballast.

THE PROBLEM OF SECOND TRACK

One problem that is particularly aggravating to the maintenance man arises when a second track is constructed along the main line. The new embankment is naturally a slab on the side of an old fill—it settles while the old bank does not. This creates a pocket in the center of the double track, where a cleavage plane also naturally exists, as the old and new fills have not knitted together. Assume two feet of snow on the fill, all densely packed through the action of pilot plows; the cut immediately above is likewise packed with snow—along comes a warm rain, it may rain from three to seven inches in 24 hr., the snow will melt, and be equivalent to at least eight inches more of rain. Thus the fill must resist the equivalent of a deluge of rain, a large part of which flows to this pocket in the center of the double track, but in addition to this the cut above, due to the grade line—the ballast section itself being 27 ft. wide, is precipitously discharging the combined run-off of rain and melting snow from its watershed. True, not all of it goes into the ballast, but in spite of the best possible maintenance of ditches, a very large portion of this water enters the depression and cleavage plane above described, and the new railroad fill goes out. The wonder is that any of the embankment remains under such conditions.

We must observe and study the laws of nature—not oppose them—they are simply everyday facts. In this case what are they?

(a) New embankment will settle and shrink;
(b) Snow will melt;
(c) Water will seek its lowest level;
(d) Dirt mixed with water will not stand on the normal angle of repose.

I have corrected such cases as the one described by constructing at the lower end of a cut a diagonal trench under the track and extending down into the sub-grade about four feet, building within this cut a bulkhead of redwood plank, with one plank at the bottom so placed as to form a gutter on the upper side, fill in with large rock and slag. Back of the bulkhead the remaining portion of the trench to be filled with non-porous material, well tamped in place. I have seen such drains discharge an enormous amount of water during a storm.

Fills are frequently constructed on sidehill slopes and in ravines, founded on unstable formations, there usually being a layer of ten to twenty feet of soil or decaying vegetation resting on shale or clay stratum, sloping downward. The weight of the superimposed embankment and rolling load causes this top soil to squeeze out, which naturally takes the embankment along with it. Invariably you will find that the water from the hillsides above, or from unseen springs, has percolated down to the clay or shale stratum and formed a lubricant upon which the

*Abstracted from a paper presented before the Pacific Railway Club at San Francisco, Cal., on December 7, 1920.

top soil slides. The solution of this problem is to intercept the water above the fill and carry it away.

DRAIN TUNNELS

The Southern Pacific has corrected a great many conditions of this kind successfully by means of drain tunnels. A very successful drain tunnel is located on the Coast division, just east of Tunnel 10 on the Santa Lucia mountains. The fill was on the sidehill, right off the portal of the tunnel. It had always given trouble, but during the winter of 1909-10 it became very serious, due to the heavy rains. The settlement was so great that a large force of men were constantly engaged, day and night, in picking up the track, after the passing of each train; a steam shovel was required to furnish the material. It is estimated that the fill settled considerably over 100 ft. during the few months.

In attempting to find a solution for the trouble we noted the absolute absence of water above the track, except in rainy weather, and then only in small quantities. The upper portion of the sliding fill for about 100 ft. in depth was absolutely dry, below this water was traced coming out of the rim of the slide, that is, where the sliding material joined the solid hillside; below this point the fill was saturated with water. We reasoned that somewhere about 100 ft. below the track there must be a live spring of water coming out of the hillside, possibly on the contact between two strata formations. We sank a shaft above the track and discovered a well-defined contact.

The next thing for us to do was to go down on the rim in the solid material, a short distance below where the water came out, and start tunnels on such a grade as to connect with the shaft above. This was done and a large amount of water was encountered, one spring was cut into that flowed 900 gal. per min., and during ordinary summer conditions the water, measured at the portal of the main drain tunnel, amounted to over 1,200 gal. per min. During the winter time the flow was increased to a very substantial stream.

Shortly after the completion of these drain tunnels the track stopped settling, and only ordinary maintenance has been required since then. Several more slides in the immediate vicinity were corrected in a similar manner, and the drain tunnel principle has also been successfully utilized on the Sacramento, Shasta and Portland divisions.

Another very difficult problem in roadbed maintenance is found along the Pacific ocean, where the strata formation pitches at an angle of about forty-five degrees into the ocean. The action of the waves wears away these strata one by one. The waters from the hillsides above percolate along the cleavage planes, the result being that as fast as one ledge is cut off it slides down into the ocean.

These conditions are corrected by the construction of sea walls. A sea wall must serve a dual capacity—it must be designed as a retaining wall to hold up a very heavy burden, and must also resist the tremendous pounding and wearing action of the sea. They should be built with a curved face to the ocean so as to deflect the course of the waves and turn them back upon themselves.

The sea likewise creates another difficult problem in the formation of the sand dunes, which are always on the move, and if any railroad track is in sight, always moving toward the railroad. The action is as follows: The winds sweep in from the ocean, pick up the dry particles of sand and sweep them along close to the surface of the earth, gradually mounting higher, forming small hills; when the edge of the hill or sand dune is reached the particles of sand are dropped, the wind continuing on. This has the effect of always building the sand dunes higher and moving them constantly ahead.

The solution is to cover the surface of the sand with a green vegetation—the problem is to find a grass that, when planted, will grow in the sand under such adverse conditions. The bent or bunch grass has been found ideal for this purpose.

RAILS

Sixty years ago railroads used 50-lb. iron rail. Then came the wonderful invention of Bessemer steel rails. As rolling loads became greater, the weight of rail increased more or less in a proportional manner, so that now the common size is 90-lb., 100-lb. to the yard, and even up to 135-lb., as used on some eastern railroads.

In former years everybody took a fling at designing rails, with the result that the rail manufacturers were loaded up with enormous number of rolls, each different from the other in small details. Theoretically, there should be a different kind of rail used on curve track, as compared with tangent track, and in cold countries as compared with warm countries. However, all conditions of temperature and both curve and tangent track will be found on any one railroad system. It is therefore necessary to adopt a rail that will fit the average general condition, rather than some particular portion thereof.

The Southern Pacific has given the matter a great deal of study and attention, kept very careful statistics as to rail failures, and I have been very much interested in a diagram published on page 48 of the September Bulletin, American Railway Engineering Association, showing the record of rail failures in the United States and Canada for the period covering the years 1913 to 1919, and plotting a curve of the desired reduction in rail failures from year to year which has been labeled "The Dream." It is a matter of great interest to me to know that a similar curve, plotted for the Southern Pacific lines, shows in all cases a curve actually much below the so-called "Dream." In other words, the "Dream" contemplates that in the year 1924 rail failures will have been reduced to 50 per 100 track miles. Our record shows that we came below the 50 mark in 1915.

SNOW TROUBLES

In the early days it was customary to hire hundreds, almost thousands, of snow shovelers during the winter time. Nowadays this is impossible, and we are fortunate in being able to replace man power by machine. Thirty years ago the road was kept open by putting 3 or 10 engines on a push plow, reinforced by this army of men. Now we do it by means of a big Mallet behind a modern rotary. Other tools used are pilot plows, headlight plows, flangers and by the following tools ordinarily associated with earth work—that is, ditchers, industrial cranes and spreaders.

The Sierra Nevada mountains in Placer and Nevada counties have been classed by the United States Weather Bureau as the region of greatest snowfall. I have seen snow on the level, time and time again, 10 ft. deep, and occasionally 26 ft. deep, but in spite of it, with the above tools and a comparatively few men, we were able to keep the usual passenger and freight traffic going with only minor delays.

At the summit, on the Central Pacific, which is the top of the mountain, the total snowfall during the winter of 1879 and 1880 was 65 ft., the same in 1889 and 1890, and the greatest depth at any one time during these winters was certainly at least 30 ft.

Deep snow and steep hillsides call for snow sheds—these are timber structures, approximately rectangular in size, 16 ft. wide for single track and 22 ft. high on

the inside, built of heavy timber and constructed along peculiar lines of architecture. It is difficult to compare them with the ordinary types of structures, and I am reminded of the sayings of a boomer brakeman who came to the trainmaster to quit, saying, "Give me my time, I didn't quit my old man's ranch to come out here and work in a barn"; and another who said, "Chummy, did you ever work in a rat hole thirty miles long before?"

Some people seem to think that snow sheds are unnecessary. Mr. Ahern, superintendent of the Coast division, has had some experiences with persons who knew how to handle snow troubles; he worked on the Sierras during those trying days of '89 and '90, was in charge of opening the line, after days of little sleep and hard work. He was snatching a little sleep on top of a table in the telegraph office at Alta one night, when the operator woke him up by saying, "Here is a man sent to you by the general office." The party introduced himself as from Philadelphia, and that he was an expert snow fighter, and undoubtedly could be of great assistance in opening the line. Mr. Ahern inquired, "What is your proposition?" "Well, I have always found salt to be the best solution in snow fighting." Mr. Ahern's reply was, in effect, "You will have to have considerable salt up here." The next morning he conducted him up through the snow sheds, and finally up three flights of stairs into a local hotel, so as to look out above the snow and get a view of the landscape. The gentleman from Philadelphia decided that to create a shortage in the salt supply of the world was inadvisable.

Service Results With Western Tie Timber*

BY P. R. HICKS
Engineer in Forest Products, U. S. Forest Service, Madison, Wis.

THE LIFE OF a tie depends upon its resistance to decay as well as upon its mechanical properties. In a previous article the mechanical properties of various western species were discussed. In this article data on durability are presented.

Decay is influenced by a great variety of factors, among the most important of which are the species and quality of wood used, climate, soil, drainage, etc. Since various combinations of these factors will occur in different cases, the durability of a given species cannot be expected to be always the same. In most species of timber the sapwood is very much less durable than the heartwood, and the amount of sapwood present, therefore, is an important factor in the durability of untreated wood. Timber cut from dense (heavy), close grown wood is usually considered more durable than that cut from more rapidly grown wood. Decayed heartwood, which is often found when the tree is felled, may be a big factor in the short life of many ties, although a small amount of heart rot in cedar ties may not have much influence. Timber used in soils that are always wet or always dry is more durable than that placed in soils alternately wet and dry, and it usually resists decay much longer in cold than in warm climates.

Many theories have been advanced regarding the durability of ties when cut at various seasons of the year. Investigations of the Forest Products Laboratory indicate that the time of cutting has very little effect upon the durability or other properties, if the timber is properly cared for after it is cut, but the method of handling ties at different times of the year does influence their durability.

Ties cut in late spring and early summer are more likely to be attacked by insects and fungi, because the wood is freshly cut and in the most favorable condition for attack at a time when insects and the sports of fungi are most active. Seasoning also proceeds more rapidly during the warmer months and may cause excessive checking. If the wood is peeled when cut and piled openly on skids for seasoning, the opportunity for decay will be reduced to a minimum, but checking will not be retarded. In no case should the wood be allowed to lie in direct contact with the ground. If checking is an important consideration it can be reduced somewhat by locating the piles in a shaded but dry place. The bark peels most easily in spring; it can be removed at any other time of the year, but the labor and expense will probably be greater.

Timber cut in late fall and winter seasons more slowly and with less checking than during the warmer months, and when proper storage or handling is impracticable winter cutting is best. Fungi and insects do not attack wood out of doors in cold weather, and by the time warm weather arrives the wood is partly seasoned and somewhat less susceptible to attack. It is for this reason that winter cutting is advantageous and not on account of a smaller amount of moisture or sap in the wood in winter, as the popular belief has it. There is practically no difference in moisture content of green wood in winter and summer.

Varied opinions have been expressed regarding the relative durability of green and seasoned, untreated ties, but where records have been kept practically no difference has been found. Unless the ties are properly cared for, decay may develop during the seasoning process. The fact that green and seasoned timber have the same durability when used in contact with the ground is easily explained. Moisture content is the principal factor in determining the rate of decay, and as soon as a tie is placed in the track it begins to give up or take on moisture according to its condition of seasoning and the conditions of exposure. Within a relatively short time both green and seasoned ties reach the same moisture content.

Peeling ties before inserting in the track is a very important factor, since placing them with the bark on hastens deterioration. The presence of bark while the ties are seasoning or in storage also encourages insect attack and decay. For these reasons ties should usually be peeled when made.

Fire-killed or dead timber that is sound and free from decay is as strong and as durable as green timber. Such timber should be very carefully inspected for decay, however, and the unsound ties should be rigidly excluded. Douglas fir usually remains sufficiently sound to make ties for 5 to 6 years after being killed. After this the sapwood becomes infested with insects and decay, but the heartwood remains sound for 8 to 10 years with the exception of the outer 2 or 3 inches. The interior of trees over 3 feet in diameter may remain sound for still longer periods. Lodgepole pine also remains sound and will make good ties for several years after being killed, but dead western yellow pine should be very carefully inspected, as it contains much sapwood and may deteriorate rapidly.

Definite and reliable data on the durability of several

*This is the second of a series of articles on western tie species.

western tie species are not available, so the opinions of railway officers on the durability of these ties were solicited. The replies for the untreated ties may be summarized as follows:

Douglas fir is estimated to have a life of 6 years east and north of the Missouri and in New Mexico, Arizona, and California. In Oregon, Washington, Montana, Idaho, Colorado and Wyoming a life of 7 to 8 years is estimated. In California locally grown Douglas fir is estimated to last 4 to 6 years. In Colorado, native Douglas fir, known locally as red spruce or red fir, is variously estimated to last from 9 to 14 years. Estimates on the life of western larch in Montana, northern Idaho and western Washington are from 5 to 8 years. Western yellow pine is said to last 2 to 8 years in California and 4 to 5 years in Colorado, Idaho and Montana. Incense cedar is said to have a life of 10 to 12 years in California, and western red cedar 8 to 10 years in Montana and Idaho. Western hemlock ties are estimated to have an average life of 5 years in Washington, redwood and Port Orford cedar 12 years in California and Oregon, and lodgepole pine 4 to 6 years in Wyoming.

Fewer estimates were made on the durability of treated western species. With a zinc-chloride treatment Douglas fir was variously estimated to have a durability of 7 to 15 years, the lower figure being for ties treated with but about ¼ lb. of zinc chloride per cubic foot in southern Idaho. Similar ties in Oregon, California, Arizona and New Mexico were estimated to last 9 years. In Montana, with a treatment of 0.5 to 0.7 lb. per cu. ft., the estimate was 15 years. Western larch in Montana with a similar treatment was also estimated to last 15 years. Western yellow pine ties, treated with 0.5 lb. of zinc per cubic foot, are estimated to last 12 to 14 years in Colorado and 12 years in Wyoming, Kansas and Nebraska, but only 7 to 8 years in California if treated with but 0.25 lb. of zinc chloride per cubic foot. Lodgepole pine treated with 0.25 lb. of zinc chloride per cubic foot was estimated to last 8 or 9 years in southern Wyoming. The estimated life of creosoted Douglas fir and western larch ties in Washington, Montana and Idaho was 18 years, and western yellow and lodgepole pine 15 years.

These estimates are from various sources and represent the use of ties under many conditions of service. After a consideration of all the available data, the accompanying table was compiled, in which the durability of western ties has been estimated. The table is based on the assumption that all treated ties are well tie-plated. Since the estimates are based on western conditions they may not apply to eastern conditions. Probably from 30 to 50 per cent variation from these estimates in the durability of these ties may be expected on account of differences in climatic conditions.

Much more accurate and definite data are desirable on the durability of ties, and this can be obtained only by service tests in which accurate records are kept. The best durability records at present available are those in the files of the Forest Products Laboratory* and these indicate that treated and untreated ties of Douglas fir, western yellow pine, lodgepole pine and western hemlock often last longer than estimated in table given above.

ESTIMATED AVERAGE DURABILITY OF WESTERN TIES†

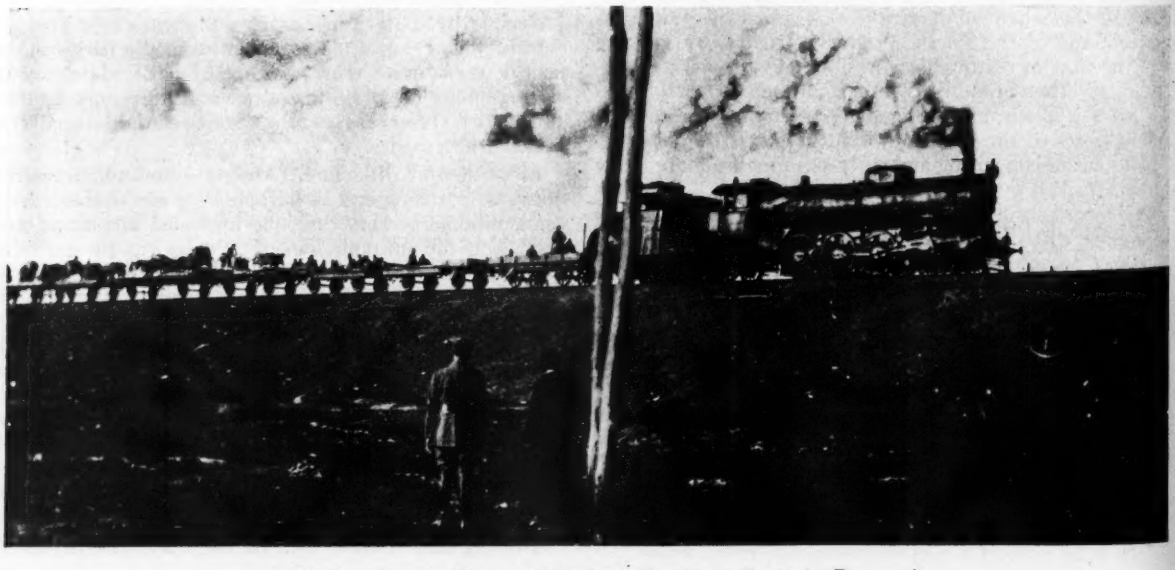
	Untreated. Years.	Treated with 0.5 lb. zinc chloride per cu. ft. Years.	Treated with 10 lb. creosote per cu. ft. Years.
Redwood	10-12	...	...
Port Orford cedar	10-12	...	...
Incense cedar	8-10	...	...
Western red cedar	7-9	...	...
Douglas fir	6-7	11	15
Western larch‡	6-7	11	15
Western hemlock	5-6	11	15
Lodgepole pine	4-5	11	15
Western yellow pine	4-5	11	15
Spruce	3-4	8	10
White fir (Abies concolor)	3-4	8	11
White fir (Abies grandis)	3-4	8	11
Red fir (Abies magnifica)	3-4	8	11
Engelmann spruce	3-4	8	11
Alpine fir	3-4	7	11

*Detailed tie service test records can be obtained from the Forest Products Laboratory upon request. Applicants are requested to give the specific names of the timbers concerning which information is desired.

†Based on use of tie plates on all treated ties and the assumption that the ties are subject to heavy traffic.

‡Used only in Montana, northern Idaho and western Washington. Douglas fir ties in this region have about same average life as western larch.

MAKING FRIENDS.—We want you to make our relations to the public uniformly courteous and efficient. Good service depends not only on what you do, but upon the way you do it. That is true of all work.—E. E. Nash, general manager, Minneapolis & St. Louis.



A Modern Locomotive and Primitive Cars in a Train in Roumania

A New Type of Bank Protection*

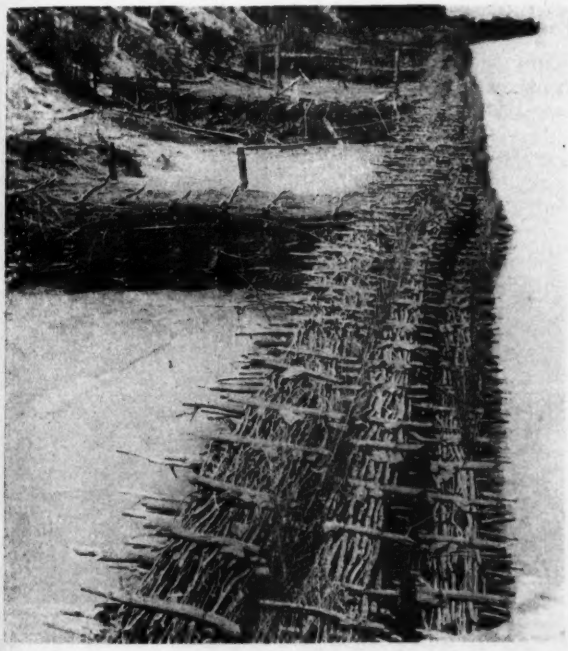
Sediment Collected by Brush-Cell Construction Forms the Support for a Concrete Pavement

By W. C. Curd,
Consulting Engineer, C. E. Smith & Co. Chicago

THE PROPERTY AND TRACKS of the Natchez & Southern at Natchez, Miss., are located for 2½ miles along the left bank of the Mississippi river on a high bank that rises precipitously to an elevation from 125 to 150 ft. above low water and, being on the concave side of a sharp bend, receives the force of the current for several miles.

In 1890, when the railroad was constructed, a single row of piles, spaced from 5 to 6 ft. apart, was driven along the water's edge where erosion was in progress. This work was of little benefit, and as the years went by other ineffectual forms of protection were tried, with a continued loss of bank. Up to 1912, more than $50,000 had been expended in this manner without satisfactory results.

Following the severe flood of 1912, an examination of the location was made and so much of the bank was found to be lost that it was considered imperative to take steps for relief. The writer, then drainage engineer for the Missouri Pacific System, and in charge of river-protection work, made an investigation of the conditions and designed an improvement, the completion of which was to extend over a period of from 5 to 6 years, at an estimated cost not to exceed $50,000. The design was subsequently approved and all work in connection therewith completed in the early part of 1918, at a total expense of $38,741.



The Mud-Cells Were Formed by Walls of Woven Brush

It was apparent that the correction of the difficulty lay, not only in preventing further erosion, but in a restoration of the foot of the bank so that a toe might be formed and a slope worked back to the brow of the hill. Material was scarce, as the few cuts along the track would not yield enough excavation to form the toe, and the expense of having such material loaded, hauled, unloaded and placed in the right locations along the river-front was excessive.

The Mud-Cell Construction After One High Water Showing Deposit of Sediment

With the local conditions to be met, and having in mind his previous experience with various types of control works for producing scour and deposits, the writer decided to adopt mud-cell construction as affording the cheapest means for getting results. A conglomerate stratum offered a foundation secure against scour and one on which a deposit of required width and height could be carried safely. The problem then was to gather sediment from the river, deposit it to as great a height as possible, and hold it in position against erosion, so that future slides from the top of the hill would find a permanent lodging place and a stable slope be built up by casting over the side of the hill such material as would become available from time to time.

The design required that the improvement be carried out in two parts: First, to produce sedimentation, and, second, to protect permanently the slopes after sedimentation had progressed sufficiently. The first part called for the construction of a mud-cell dike with a pile dike at its head as a protection against direct currents, and the second, the construction of a low concrete toe or retaining wall with a reinforced concrete slab paving on the slopes above.

The mud-cell dike was constructed in the fall of 1912. It was 1,100 ft. long, 23 ft. high and from 75 to 100 ft. from the foot of the hill. The mud-cells were made from live brush and poles which were cut and towed from an island several miles up stream from the work. A 12-in. foundation mattress, 30 ft. wide, was first laid directly on the conglomerate. This was formed by laying the brush in bundles, or fascines, which were wrapped at 4-ft. intervals with single lashings of No. 9 galvanized wire. Anchor lines of ½-in. galvanized strand, spaced

*Abstracted from a paper published by the American Society of Civil Engineers.

50 ft. apart and woven into the mattress, were run back to deadmen at the foot of the hill. A tier of cells, 5 ft. by 5 ft., was built on the foundation mattress by placing single rows of brush and poles at right angles to each other, very much after the fashion of a log cabin. At a height of 5 ft. the cells were floored over with a layer of brush and a second tier of cells was started 5 ft. back from the river face of the dike. Five tiers of cells were placed in this manner, forming a completed dike 28 ft., or

How Concrete Reinforcing Was Placed on the Slab Forms

five cells, wide at the bottom and 5 ft., or one cell, wide at the top, and a settled height of 23 ft. All cell walls were bound with wire and cable to the foundation course, as well as to deadmen at the foot of the hill. To prevent the cells from floating when submerged, they were ballasted with loose conglomerate picked up along the river front. A connection with the hill at the lower end of the dike was made by joining the latter to an old abandoned transfer barge which had been sunk in line during high water just previous to the commencement of the dike. Six lateral mud-cell dikes, or baffles, 15 ft. wide by 10 ft. long, were connected into the main dike and run up the hill to prevent parallel currents and eddies in the enclosed area where sedimentation was being sought.

During the low-water period of 1913 the permanent pile dike to protect the mud-cell dike against headwater was completed. This dike extended from a point up stream to an outside lap connection with the mud-cell dike, a distance of 600 ft. The structure ranges from 8 ft. to 42 ft. in height above the natural ground surface, the top being at an elevation of 56 ft. on the Natchez gage. It is made up in a width of 112 lin. ft. with piles in single rows, 216 lin. ft. in double rows and 272 lin. ft. in three rows, with 3½-in. by 10-in. white oak sheeting spaced 2 in. apart, applied to the outer, or river, face of the dike. Cypress piles ranging in length from 32 ft. to 62 ft. were used and 16-ft. to 20-ft. penetrations were obtained through the conglomerate, under hard driving. The piles were spaced 8 ft. center to center, and driven in staggered position so as to gain additional strength against overturning. This necessitated an intricate system of bracing.

When an examination was made in the summer of 1916, it was found that decay had begun to show among the brush and poles forming the mud-cells, and as sedimentation had progressed to an extent that the enclosed area was practically filled and a growth of willows had appeared on the surface, it seemed advisable to proceed at once with the second part of the plan, the permanent protection of the slopes.

In preparation for the permanent slope protection, all the projecting ends of the brush and poles in the mud-cell dike not covered by deposits were chopped away. The debris was deposited on the slopes for further use and a trench dug along the foot of the mud-cell dike for the toe wall. The bottom of the footing course was placed at about the 10-ft. level, Natchez gage, which gave a depth below the exposed surface of the conglomerate of from 3 to 5 ft., this depth being ample to afford protection against under-scour in this location. The toe wall was reinforced with galvanized mesh and carried to a gage height of 14 ft., at which elevation the concrete slabs were connected to it.

The bulk of the sediment recovered by the mud-cells was deposited between the dike and the foot of the hill, and did not completely fill the cells. After removing the projecting cells, it was found that some filling would be required to bring the surface of the slope to the elevation at which concrete paving was to be placed. This condition was provided for by casting the slabs in place on supported forms. The slabs were 4 in. thick, 54 in. wide, 14 ft. long, and reinforced with galvanized mesh. They were placed on a 3 to 1 slope, and cast in alternate sections.

On all supported work the space underneath the forms was filled with debris from the mud-cells. This was done to collect sediment during high water. As the first row of slabs was nearing completion, high water came and, as was expected, sufficient sediment was collected to fill solidly the space thus left. The flooring was made up in panels or sections which were removed after the concrete had hardened sufficiently to support itself. Formwork was unnecessary for the upper part of the slope, and the slabs were cast directly on the ground. The amount of paving constructed was 39,744 sq. ft., being 46 ft. wide on the slope, or up to a level of 33 ft., Natchez gage, and 864 ft. long.

The Completed Paving in the Foreground, with the Pile Dike in the Distance

The writer estimates that approximately 56,000 cu. yd. of material were recovered. On that basis the unit cost of restoring the foot of the bank was 16.6 cents per cu. yd., very much less than would have been required in that location by any other method. The general results of the work have been all that could be expected.

The Labor Board. Top row, left to right: Horace Baker, Albert Phillips, R. M. Barton (chairman), W. L. Park, J. H. Elliot. Bottom row: A. O. Wharton, G. W. Hanger, J. J. Forrester, H. T. Hunt.

LABOR BOARD HEARS WAGE CONTROVERSIES

Pleas of Roads to Set Aside National Agreement and to Reduce Wages of Unskilled Labor Under Consideration

UNSKILLED railroad laborers, and particularly track laborers, will not be subject to reductions in their basic wages until hearings have been properly held and a decision rendered by the United States Railroad Labor Board. This development has come about as a result of the hearings and orders in the wage and working condition controversies which have come before the United States Railroad Labor Board at Chicago during the past three weeks. The statement is predicated on: (1) The Board's refusal on February 10 to grant General W. W. Atterbury's requests, made on January 31, on behalf of the carriers, for the right to pay unskilled labor the prevailing rate in the territory in which they are employed, and (2) on the Board's orders to the Atlanta, Birmingham & Atlantic, the Missouri & North Arkansas and the Erie to rescind their announced wage cut orders pending hearings and decisions by the Board.

The progress of the controversy over the continuation of National Agreements was reported in the February issue of the *Railway Maintenance Engineer*. These hearings had been in progress since January 10. As a matter of fact, the question of continuance of the National Agreements, established under government control, has been pending in one form or another ever since the railways were returned to private operation on March 1, 1920. Arguments in support of the continuation of these agreements were included in the controversy before the Board which ended in the wage decision of July 20, 1920. On January 10, when these hearings were resumed, the spokesmen of the various labor organizations rested their case upon their previous presentation except for rebuttal. The carriers' presentation in this controversy was finished just prior to January 31, when General Atterbury, after a three-day conference with the labor committee of the Association of Railway Executives, went before the Board with his requests, which were described in the last issue of the *Railway Maintenance Engineer*. Representatives of the labor organizations then attempted to take the case out of the hands of the Board by appealing to President Wilson. This move, however, was unsuccessful, for on February 6 President Wilson, replying to the telegrams addressed to him by the labor leaders and the railway executives, declined to interfere in the controversy. The labor leaders had asked for a Congressional investigation of the railroad situation, but the President in his reply indicated confidence that the case was in the hands of the proper tribunal and he, therefore, referred the copies of the telegrams to the Board and to the Interstate Commerce Commission for such action as they deemed wise.

Carriers and Employees Outline Their Positions

B. M. Jewell, president of the railroad department of the American Federation of Labor, declared that the President's message was a complete vindication of the stand taken by the unions in that it "makes it perfectly clear that the Board should confine its jurisdiction strictly to the controversy as to wages and working conditions, leaving financial matters to the Interstate Commerce Commission."

General Atterbury soon after issued a statement in reply to this, saying in part:

"His hope that the financial results of existing rules and working conditions can be hidden from either the Labor Board or the public will not be realized. He would maintain indefensible waste and inefficiency even at the cost of destroying the earning power of the railroads or of compelling them to go to the Interstate Commerce Commission for still higher rates."

This reply was followed in turn by the issuance of two statements by General Atterbury, in both of which he presented evidence to sustain his contentions made before the Board on January 31. The first statement said in part:

"The railways have asked the Railroad Labor Board to approve the re-establishment of the agreements, rules and working conditions in effect in December, 1917, because they believe it is

absolutely necessary to effect economy by the reduction of the present huge railway payroll. They believe that this reduction of the payroll can be effected at this time with more justice to railway employees and the public by establishing rules and conditions of work which will make practicable a great increase in the efficiency of labor and of railway operation than by a reduction of basic wages, except those of unskilled labor.

"One of the classes of employees included in one of the national agreements is the maintenance of way employees. In 1917 the railways had 350,000 section men and other unskilled laborers, and in 1920 367,000. The wages paid to them in 1917 amounted to $220,000,000, while, after the wage award made by the Railroad Labor Board, their wages, as near as can now be estimated, were running at the rate of $476,000,000, an increase of 112 per cent.

"The railways in asking the Labor Board's approval to return to the rules and working conditions in effect at the end of 1917 are merely asking the opportunity to begin a restoration of the efficiency of labor, which must be attained in order to secure efficient and economical operation of the railways. The public returned the railways to private operation in the belief that it would be more efficient and economical than government operation. The Transportation Act requires efficient and economical operation of the railways. Efficient and economical operation cannot, however, be secured without removal of the great restrictions upon and obstacles in the way of efficient management which are set up by rules and working conditions which were adopted by war measures. The railways desire to treat their employees with entire fairness. All charges to the contrary are baseless. They cannot, however, assume the responsibility for consenting any longer to a continuance of conditions which make efficient and economical operation possible."

General Atterbury authorized a second statement, in which he said in part as follows:

Thirty-six railroads estimate that they failed to earn even their operating expenses for the month of January. While earning their operating expenses, 28 additional roads estimate that they did not earn their taxes and fixed charges during the month of January. Under present traffic and operating conditions these were the results despite the fact that the 64 companies referred to—of which only a partial list is given above—have, in the aggregate, decreased their labor cost of operating by laying off approximately 200,000 employees since September 1, 1920.

MR. JEWELL ASKS FOR MORE TIME

While both the carriers and the employees were publicly defining their respective positions in this controversy, Mr. Jewell petitioned the Labor Board for additional time in which to prepare his reply to General Atterbury's requests. This petition was opposed by E. T. Whiter, who presented a letter on this subject written by General Atterbury and vigorously opposing any further extension of time. After consideration in executive session, however, the Board granted Mr. Jewell's request and February 10 was set as the date upon which he would be heard.

Chairman Barton on February 10 denied General Atterbury's requests for immediate abrogation of the National Agreements and for the right to pay unskilled labor the prevailing rate in the territory where they are employed. He stated that the Board must hear all of the evidence before ruling on the National Agreements and that it was powerless to grant General Atterbury's request regarding unskilled labor because the matter has not been brought before the Board according to the procedure outlined by the Transportation Act.

Mr. Jewell, again appearing before the Railroad Labor Board at Chicago on February 17 in the resumption of hearings in the controversy over National Agreements, asked that the Board take the following steps immediately:

"First: That the Board refer the National Agreements which are now before it to a joint conference of the representatives of the railroads and of the labor organization with the recommendation that their disagreements be adjusted by negotiation as soon as possible—the Board agreeing to pass immediately upon any points of difference which may arise from the negotiations.

"Second: That the Board request the representatives of the railroads and representatives of the labor organizations to meet the Board in conference to consider the establishment of boards of adjustment as contemplated by the Transportation Act.

"Third: That in reply to Mr. Atterbury's notice to the Board and his subsequent letter to the chairman advising him that he contemplates filing a flood of individual complaints to reduce the wages of unskilled employees, the Board recommend to Mr. Atterbury that he meet in general conference with the representatives of the employees affected so that the existing General Agreements will not be impaired and the matter brought to the Board in the form of a single complaint."

Mr. Jewell declared his constructive proposals were brought forward with the following objects in view:

"1. To insist upon the fundamental principle of collective bargaining, which is now the real issue before the Board in our pending cases.

"2. To expedite the cases which otherwise will absorb a vast amount of time and effort.

"3. And to restrain Mr. Atterbury and the railroads from preventing the proper functioning and destroying the effectiveness of this Board by flooding it with a large number of individual complaints which it cannot handle."

Mr. Jewell presented as an alternative the necessity for postponing the case until March 14 to allow time for the preparation of a reply to the carriers' presentation.

MAINTENANCE OF WAY AGREEMENT TO BE DEFENDED ON MARCH 1

On February 19 the Board announced, in answer to these requests, that the presentation in support of the agreement with the maintenance of way employees would begin on March 1, to be followed in order by the presentations in support of the agreements with the clerks, firemen and oilers, and signalmen. Mr. Jewell was granted until March 10 to prepare his reply. The requests for joint conferences were ignored by the Board's ruling. In addition they were flatly turned down by the Association of Railway Executives in session at Chicago on February 18. The report of the Labor Committee of the Association made at that time said in regard to the wages of unskilled labor: "The decision of the Board upon our request for immediate approval of reductions in the wages of unskilled labor relegates the initiation of action upon this matter to the individual railways and their employees."

ATLANTA, BIRMINGHAM & ATLANTIC CASE

The efforts of the Atlanta, Birmingham & Atlantic to secure authority to reduce the wages of its employees below the rates set by the Board's decision of last July have attracted much attention, the case coming before the Board simultaneously with the introduction of General Atterbury's evidence in the National Agreements hearings outlining the precarious financial condition of many of the carriers. The Atlanta, Birmingham & Atlantic ordered a cut in the wages of its employees effective on February 1 because of its inability to meet its operating expenses. Despite drastic reductions in working forces and in train service the carrier was losing about $100,000 a month. The employees objected to the wage cut and, when conferences were held between their representatives and representatives of the carrier, a controversy arose as to whether the wage reduction could be made effective, under the terms of the Transportation Act, pending a decision by the Labor Board. The representatives of the carrier held that the wage cut was unavoidable and would have to be made on the date announced, even though the Board had not reached a decision on the employees' appeal. The employees held that the existing rates of pay should be continued until the Board had made its ruling.

When the case came before the Labor Board on January 25, the employees refused to present evidence in the case until the Board had instructed the carrier to rescind its wage cut order. The representatives of the carrier, after presenting voluminous evidence showing the financial condition of the road, held that they had not violated this

spirit or letter of the Transportation Act in cutting their wages first and then coming before the Board. Subsequently the Board passed a resolution upholding the employees' contention and ordering the carrier to rescind its wage cut order.

Hearings in the Atlanta, Birmingham & Atlantic case were completed on February 15, and the Board decided on February 21 that the dispute should be remanded for further conference between the carrier and its employees, declaring that it was without jurisdiction as the controversy stood. This ruling means that failure to agree in a conference of the railroads and their employees on whether present wages are just and reasonable is the only basis on which the Labor Board will consider railroad wage revisions at present.

A further development in this case occurred on February 25, when action was taken in the federal court at Atlanta on the petition of a Birmingham bank for the appointment of a receiver for the Atlanta, Birmingham & Atlantic. The road agreed to the receivership.

THE MISSOURI & NORTH ARKANSAS CASE

Another case similar in many respects to that of the Atlanta, Birmingham & Atlantic was also brought before the Board on February 15. The Missouri & North Arkansas, through an order issued by the receiver of the road, C. A. Phelan, reduced the wages of its employees on February 1. The employees protested to the Board and as a result the case was docketed. In the meantime the employees of the road walked out and their places have been filled with "imported labor."

Mr. Phelan in making his presentation on behalf of the carrier took the position that the carrier is not legally before the Board, because, not being a party to the controversy which ended with the Board's decision No. 2, it has never been heard on the subject of wages and has not therefore violated the Board's award in reducing the wages of its employees. The rates of pay fixed by decision No. 2 had been applied on the Missouri & North Arkansas only on the condition that the road could earn enough to pay them. M. C. Carry and Charles MacGowan, appearing in the case on behalf of employees, asked the Board to refuse to hear the case because the company had violated the Board's ruling by putting into effect a wage cut without authority from the Board.

In this case the Board ruled on February 21 as follows:

"It is the opinion of this Board that the action of the carrier in reducing wages February 1, 1921, after an application for hearing had been filed by the organizations interested was improper. However, extenuating circumstances exist in this case, particularly in that this board failed to act in the premises prior to February 1. For this reason the Board does not deem it judicious to proceed under section 313 of the transportation act.

"It is the decision of the Board that all employees, including those who have been laid off on their being returned to service, accept under protest the wages offered."

The Board also held that the road had not, in conference with employees, taken up the justness or reasonableness of present wages, granted by the Board, and that until this was done the Board could not act.

BOARD HALTS ERIE WAGE CUT

Following the precedent established in the Atlanta, Birmingham & Atlantic case the Board issued an order on February 14 directing the Erie to rescind its recent order reducing track laborers' wages, re-establishing the seven-day week for train despatchers and deducting the January 31 earnings of telegraphers. The order was to have been effective on February 1. The United Brotherhood of Maintenance of Way Employees and Railroad Shop Laborers and the American Train Despatchers' Association filed a complaint with the Board, and the following resolution was passed by the Board as a result:

RESOLVED, In case of disputes which have arisen between the Erie Railroad and its employees by reason of the said railroad having reduced the wages of track men to 30 cents per hour, effective February 1, and having ordered that train despatchers work 7 days per week without relief and having ordered the deduction of January 31 earnings of telegraphers whether they work or not on that day, that objection having been made by the United Brotherhood of Maintenance of Way Employees and Railroad Shop Laborers and by the American Train Despatchers' Association and a dispute having arisen in regard to the proposed reduction and the matter having been brought before this Board, the Board decides that no change of any kind in the rates of pay or in the rules and working conditions shall be made, except by agreement between the parties, until the disputes are heard and opportunity given for this Board to decide. The Board will proceed with the further hearing and consideration of these disputes and sets February 23, 1921, as the date of such presentation of evidence and arguments as the parties may desire to offer.

The Board suggests further conference between the parties and an effort on their part to agree upon a settlement.

WHEREAS, This Board having reason to believe that Decision No. 2 of this Board has been violated by the Erie Railroad in that the said carrier on or about January 31, 1921, directed the reduction of wages of the trackmen, employees of the said carrier, to 30 cents per hour, contrary to Article III, Section 6, of Decision No. 2 of this Board, and also having directed the deduction of January 31 earnings from the January earnings of all monthly rated employees and of all daily rated employees classified as monthly rated employees prior to Decision No. 2 of this Board.

RESOLVED, That pursuant to Section 313, Transportation Act, 1920, notice be given to the chief executives of the Erie Railroad and to the organizations of employees directly interested in such orders of the said carrier of a hearing to determine whether in the opinion of the Board a violation of the decision of this Board has occurred.

The Board set February 23, 1921, as the day of the hearing.

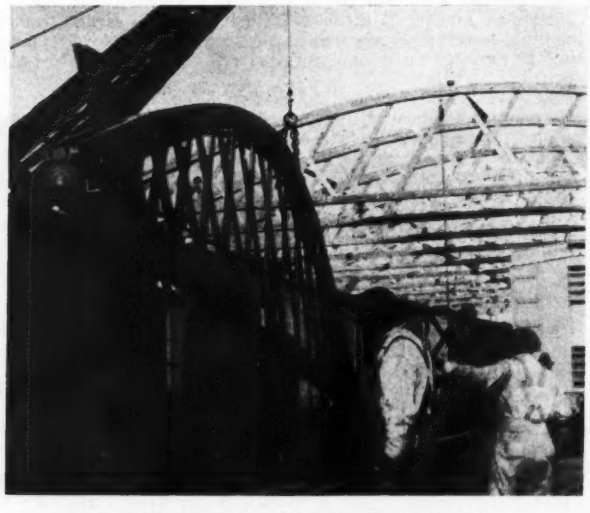
The Erie employees at the hearing before the Board on February 23 were represented by J. C. Smock, F. W. McLaughlin and W. S. Bratton, all representatives of the maintenance of way workers, and J. G. Luhrsen, president of the American Train Despatchers' Association, representing the train despatchers. The Erie was represented by Samuel Adams, H. A. Taylor, general solicitor, and Clyde E. Shorey. Mr. Adams and R. S. Parsons, general manager, presented most of the testimony on behalf of the road, the wage cut orders issued by the Erie being justified by both on the grounds of the road's inability to pay the wages fixed by decision No. 2 of the Board. Mr. Adams pointed out that the employees had objected to changes made in the working conditions. However, this is not a point in dispute inasmuch as the subject is now under consideration by the Board. In reply to questioning, Mr. Adams said the Erie had not complied with the Board's order to rescind its wage cut ruling and held that the Board had no jurisdiction to make "stay" orders without representation of all the parties interested. R. S. Parsons stated that the Erie was paying $1.07 for every $1.00 taken in during the first two months of January. He pointed out that the reductions ordered in the Erie's ruling of February 1 were temporary and that, furthermore, a flat cut to 30 cents per hour for unskilled labor did not state the results of that order properly. Mr. Parsons pointed out that the order was to pay the going rate for unskilled labor. This ruling, he pointed out, has resulted in paying unskilled labor in the vicinity of Youngstown 38 cents and in the vicinity of Chicago the same rates as has been fixed by the Board's decision No. 2. Only in outlying districts has the rate of unskilled labor been reduced to 30 cents per hour.

The hearing was closed on February 23 and will not be reopened unless the Board issues a special order to that effect.

A SIMPLIFIED ROOF DESIGN TO PROMOTE ECONOMY

IN THESE DAYS of stringencies in money and much work to be done, anything descriptive of relatively inexpensive construction methods is certain to be of value. For that reason alone, the work on the new freight car repair sheds of the Atlantic Coast Line at Waycross, N. C., is of interest, since on this job both labor and structural costs were kept at a minimum. The principal features of the structure was the simple, unique and inexpensive design of the roof truss and the installation methods, the use of which made it possible to complete the entire work of reconstruction without any interruption to the car repairs and the machinery. Also the work was so well organized that there was not the slightest accident or personal injury during its progress.

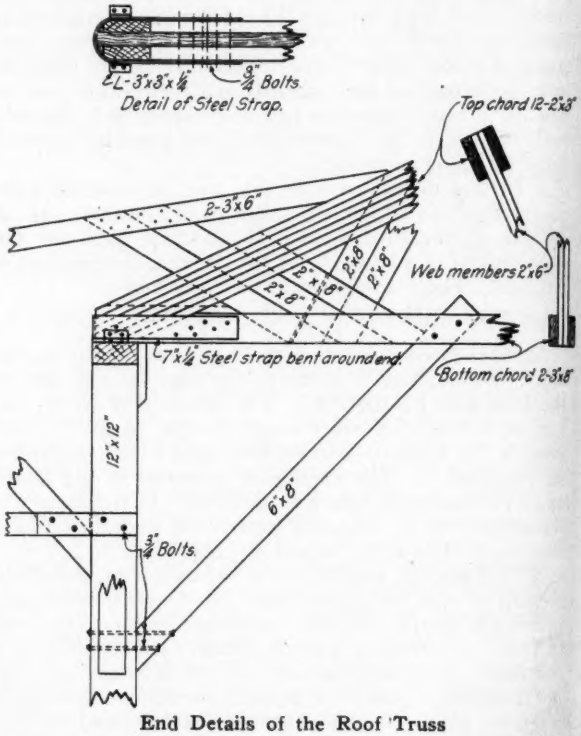
The original sheds at Waycross were destroyed in April, 1920, and while company designs were made at that time for a new structure, it was finally decided to contract the work, letting the contractor build the new repair sheds on the original site, following contractor's own design of roof construction rather than that of the railroad. The results obtained showed that by following this procedure an estimated saving of over 20 per cent was effected.



Locomotive Cranes Speed Up the Work

The new building is in reality one shed, 672 ft. long, though broken into two sections by a 30-ft. space located about midway for the purpose of lessening the fire risk. The roof structure is supported by three longitudinal lines of timber posts spaced 15 ft. center to center, thus dividing the working space into two bays measuring 76 ft. and 29 ft. wide, respectively. The main bay contains four car-repair tracks and one service track. The smaller section or "lean-to" houses the necessary machinery, forges and tools, etc., to carry on the repair work. The clearance in the main bay is 20 ft. 4 in. and in the smaller, 15 ft. 10 in.

The design of the truss is somewhat unusual in that, though the span is 76 ft., the largest timber used in its construction was 3 in. by 8 in., and that only in the lower chord. The truss is in the form of a circular segment with a rise of 9 ft. 6 in. The lower chord was built up from six pieces of 3-in. by 8-in. by 26-ft. yellow pine timbers spliced into two lines, the splicing forming a four-inch space between the two lines to allow for the overlap of the web members. The upper chord is composed of 2-in. by 3-in. by 12-ft. timbers built up into two segmental sections, each consisting of six layers of the 2-in. by 3-in. timbers placed flatwise, bent to the curve of the top chord and spiked together. This arrangement does away with all the usual sawing of the top chord pieces to obtain the curved outline. The upper and lower chords are tied together by 2-in. by 6-in. web members,



End Details of the Roof Truss

the ends of which are lapped over each other between the two lines of the bottom chord and the sections of the top. They are secured in place by ¾-in. bolts passing through both the chord and web members. The spacing of the latter members varies from 5 ft. 6 in. at the center of the bottom chord to 3 ft. near the supports of the truss. At the extreme ends additional pieces were used and extended up through the top chord in order to tie-in to the roof structure of the lean-to on one side of the main bay and the overhand on the other.

The thrust of the upper chord was transferred to the lower chord at the ends of the truss by a ¼-in. by 7-in. by 7-ft. 6-in. steel strap bent around the end as shown in the drawing and secured to the lower chord by six ¾-in. bolts. To this strap had been riveted two ¼-in. by 3-in. by 3-in. angle irons. These angle irons were punched with two 5/16-in. holes through which 60-penny nails were driven into the plates capping the 12-in. by 12-in. supporting posts, as the trusses were set in position.

The actual work of assembling and framing the roof trusses was performed in a framing yard located a short distance away from the site of the new shed. All necessary material for this work was furnished by the railroad. When completed, the trusses were picked up by a locomotive crane, swung parallel to the track and transported by the crane to the work. On arriving at that location, the crane, without changing its loading arrangement, hoisted the truss to a height sufficient to clear the cars and the plates, after which the truss was swung through an arc of about 90 deg. and then lowered into its permanent position over the supporting posts or 15 ft. center line to center line of the trusses. The entire opera-

tion of moving and placing a truss required only 13 min.

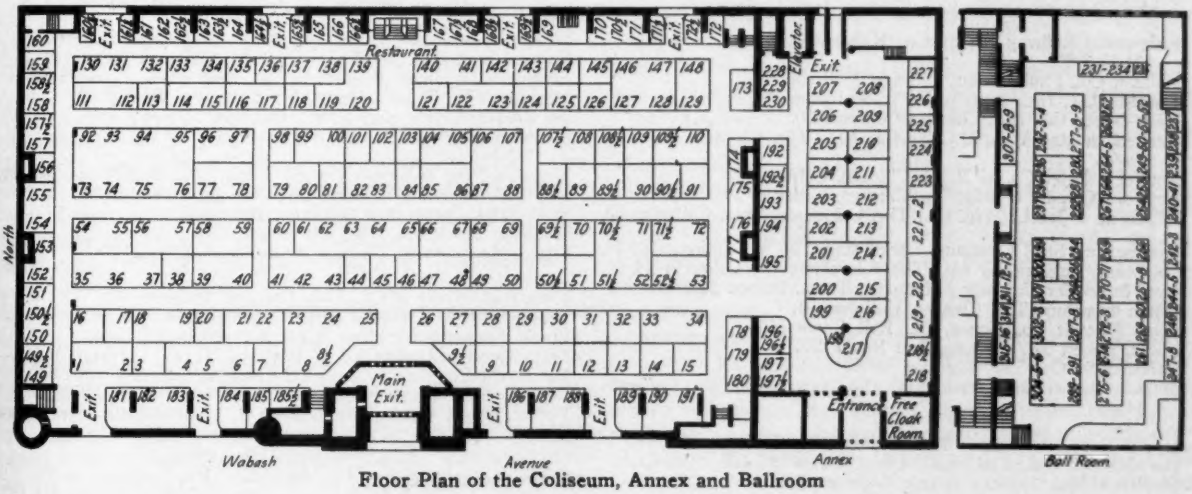
The erection of the shed was accomplished in 40 working days of eight hours with an average daily force of two supervising officers, one timekeeper, 16 mechanics and 12 laborers. The entire cost of the roof trusses was less than $2 per foot of span. The labor cost, including supervision and overhead, of the completed structure covering a superficial area of 77,669 sq. ft., was but 19 cents per sq. ft. of ground area covered, while the total cost was less than 56 cents. The contractor on the work was the Geo. B. Swift Company, Chicago.

We are indebted for the above information to R. D. Hawkins, general superintendent of motive power, Atlantic Coast Line, Wilmington, N. C.

The National Railway Appliances Exhibit

THE EXHIBIT of the National Railway Appliances Association, which will be held in the Coliseum at Chicago, on March 15-17, inclusive, will represent a considerable expansion from previous years in that space in the balcony and the ballroom above the annex will be used this year, thereby adding 17 per cent to the gross exhibit space. A total of 202 firms belonging to this association have reserved space, or 49 more than had contracted for space at the corresponding time last year. The names of these firms and the location and numbers of their booths are listed below:

Ackerman-Johnson Co., Chicago, Ball Room 246.
Adams & Westlake Co., The, Chicago, Coliseum 87-88-106-107.
Adams Motor & Mfg. Co., Chicago, Coliseum 218-218½.
A. G. A. Railway Light & Signal Co., Elizabeth, N. J., Coliseum 39-40.
Air Reduction Sales Co., New York, Coliseum 167-167½-168.
American Abrasive Metals Co., Chicago, Coliseum 166.
American Association of Engineers, Chicago, Coliseum 165.
American Car & Foundry Co., New York, Annex 203-212.
American Chain Co., Inc., Bridgeport, Conn., Coliseum 82-83.
Barrett Co., The, Chicago, Coliseum 107½-108.
Barrett-Cravens Co., Chicago, Coliseum 190-191.
Bassick Mfg. Co., The, Chicago, Ball Room 314.
Benjamin Electric Mfg. Co., Chicago, Coliseum 152-153.
Bethlehem Steel Co., Bethlehem, Pa., Annex 199-216.
Boss Nut Co., Chicago, Coliseum 1-2.
Blaw-Knox Co., Pittsburgh, Pa., Coliseum 137-138.
Brach Mfg. Co., L. S., Newark, N. J., Coliseum 169.
Brown Hoisting Machinery Co., The, Cleveland, O., Ball Room 231-232-233-234.
Bucyrus Company, South Milwaukee, Wis., Ball Room 307-308-309.
Bryant Zinc Co., Chicago, Coliseum 154-155.
Buda Co., The, Chicago, Coliseum 61-62-63-64-65.
Byers Co., A. M., Pittsburgh, Pa., Ball Room 253.
Carbic Manufacturing Company, Duluth, Minn., Coliseum 15.
Carter Bloxonend Flooring Co., Chicago, Annex 225.
Challenge Co., Batavia, Ill., Coliseum 109.
Chicago Bridge & Iron Works, Chicago, Coliseum 109½-110.
Chicago Flag & Decorating Co., The, Chicago, Coliseum 189.
Chicago Malleable Castings Co., West Pullman, Chicago, Coliseum 142.
Chicago Pneumatic Tool Co., Chicago, Coliseum 133-134.
Chicago Railway Signal & Supply Co., Chicago, Coliseum 77-78.



Floor Plan of the Coliseum, Annex and Ballroom

American Hoist & Derrick Co., St. Paul, Minn., Coliseum 88½.
American Kron Scale Co., New York, Coliseum 125.
American Malleable Castings Assn., The, Cleveland, O., Coliseum 181-182-183.
American Manganese Steel Co., Chicago Heights, Ill., Ball Room 280-295.
American Radiator Co., Chicago, Ball Room 256-269.
American Railroad Signal Supervisory Association, Chicago, Ball Room Balcony.
American Railway Bridge & Building Assn., Chicago, Ball Room Balcony.
American Steel & Wire Co., Chicago, Coliseum 70½-71-51½-52.
American Valve & Meter Co., The, Cincinnati, O., Coliseum 130-131-132.
American Vulcanized Fibre Co., Pittsburgh, Pa., Coliseum 126.
Anchor Co., Chicago, Annex 192½.
Armco Culvert & Flume Mfgrs. Assn., Middletown, O., Coliseum 99-100.
Austin Co., The, Cleveland, O., Coliseum 158-158½.
Austin Machinery Corp., Chicago, Ball Room 300.
Balkwill Manganese Crossing Co., The, Cleveland, O., Ball Room 259-260-272-273.
Central Electric Co., Chicago, Coliseum 17.
Clark Car Co., Pittsburgh, Pa., Coliseum 135.
Cleveland Railway Supply Co., The, Cleveland, O., Annex 205.
Copper Clad Steel Co., Rankin, Pa., Annex 213.
Creepcheck Co., The, Inc., Hoboken, N. J., Ball Room 285.
Crerar, Adams & Co., Chicago, Coliseum 28.
Chipman Chemical Engineering Co., Inc., New York, Coliseum 90½.
Culvert Co., L. & R., Chicago, Ball Room 242-243.
Detroit Graphite Co., Chicago, Coliseum 108½.
Detroit Steel Products Co., Detroit, Mich., Ball Room 262.
Diamond State Fibre Company, Bridgeport, Pa., Ball Room 254-267.
Dickinson, Paul, Incorporated, Chicago, Coliseum 98.
Dilworth, Porter & Co., Inc., Pittsburgh, Pa., Coliseum 27.
Dixon, Jos., Crucible Co., Jersey City, N. J., Coliseum 51.
Duff Mfg. Co., The, Pittsburgh, Pa., Coliseum 89½.
Duke Nut Lock Co., Chicago, Ball Room 274.
Edison Storage Battery Co., Orange, N. J., Coliseum 20.
Edison, Thos. A., Incorporated, Bloomfield, N. J., Coliseum 18-19.
Electric Storage Battery Co., The, Philadelphia, Pa., Coliseum 60.
Elliott Frog & Switch Co., East St. Louis, Ill., Ball Room 281-296.

Elwell Parker Electric Co., The, Chicago, Ball Room 257-258-270-271.
Equipment Corp. of America, Chicago, Annex 227.
Eymon Crossing Co., The, Marion, O., Coliseum 169½.

Fairbanks, Morse & Co., Chicago, Coliseum 73-74-75-76-92-93-94-95.
Fairmont Gas Engine & Railway Motor Car Co., Fairmont, Minn., Coliseum 41-42-43.
Federal Signal Company, Albany, N. Y., Coliseum 47-48.
Federal Electric Company, Chicago, Coliseum 171½.
Ferguson Company, H. K., The, Cleveland, O., Coliseum 163-163½-164.
Friction Car Stop Co., The, Cleveland, Ohio, Coliseum 165½.
Frog, Switch & Mfg. Co., The, Carlisle, Pa., Ball Room 287-288-302-303.

General Automatic Scale Co., The, St. Louis, Mo., Annex 204.
General Electric Company, Schenectady, N. Y., Coliseum 35-36-37.
General Railway Signal Co., Rochester, N. Y., Coliseum 49-50.
Gilbert & Barker Mfg. Co., Springfield, Mass., Coliseum 70.
Gosso Company, The, Chicago, Coliseum 168½.
Gould Storage Battery Co., Chicago, Coliseum 157-157½.
Graver Corporation, Chicago, Coliseum 96-97.
Gurley, W. & L. E., Troy, N. Y., Coliseum 69½.

Hall Switch & Signal Co., Garwood, N. J., Coliseum 85-86.
Hatfield Rail Joint Mfg. Co., Macon, Ga., Coliseum 166½.
Hayes Track Appliance Co., Richmond, Ind., Coliseum 140-141.
Henion & Hubbell, Inc., Chicago, Ball Room 244-245.
Hazard Mfg. Co., Chicago, Coliseum 21-22.
Headley Good Roads Company, Philadelphia, Pa., Ball Room 315-316.
Hebard & Co., W. F., Chicago, Coliseum 187-188.
Howlett Construction Co., Moline, Ill., Ball Room 284-299.
Hubbard & Co., Pittsburgh, Pa., Coliseum 143.

Imperial Belting Company, Chicago, Ball Room 282-297.
Ingersoll-Rand Company, New York, Annex 206-209.

Johns-Manville, Inc., New York, Coliseum 174-175-176-177.
Jordan Company, O. F., East Chicago, Ind., Coliseum 56-57.

Kalamazoo Railway Supply Co., Kalamazoo, Mich., Coliseum 23-24-25-8-8½.
Kalman Co., Paul J., Inc., Chicago, Coliseum 7.
Kaustine Co., Inc., Buffalo, N. Y., Coliseum 29.
Kelly-Derby Co., Inc., Chicago, Coliseum 30.
Kerite Insulated Wire & Cable Co., Inc., The, Chicago, Coliseum 68-69.
Keuffel & Esser Co. of N. Y., Chicago, Coliseum 90.
Keystone Grinder & Mfg. Co., Chicago, Coliseum 193.
Kilbourne & Jacobs Mfg. Co., The, Columbus, Ohio, Coliseum 45.

Lackawanna Steel Company, Lackawanna, N. Y., Coliseum 33-34.
Lakewood Engineering Co., The, Cleveland, O., Coliseum 14.
Lane & Bowler Company, Memphis, Tenn., Annex 211.
Lehon Company, The, Chicago, Coliseum 91.
Leich Electric Co., Genoa, Ill., Ball Room 266.
Lucas, Robert M., Chicago, Ball Room 238.
Lufkin Rule Co., The, Saginaw, Mich., Coliseum 121.
Lundie Engineering Corporation, The, New York City, Coliseum 145.

M. W. Supply Company, Philadelphia, Pa., Coliseum 101.
Macleod Co., The, Cincinnati, Ohio, Annex 207-208.
MacRae's Blue Book, Chicago, Coliseum 9½.
Maintenance Equipment Co., Chicago, Annex 194-195.
Massey Concrete Products Corp., Chicago, Coliseum 54-55.
McGraw-Hill Co., Inc., New York, Coliseum 185½.
Mercury Manufacturing Co., Chicago, Coliseum 116-117.
Metal & Thermit Corp., New York City, Annex 201-214.
Metal Safety Railway Tie Co., Salt Lake City, Utah, Ball Room 240-241.
Midvale Steel & Ordnance Co., Cambria Steel Company, Philadelphia, Pa., Coliseum 71½-72.
Miller Train Control Corp., Danville, Annex 197-197½.
Monroe Calculating Machine Co., New York City,, Coliseum 9.
Mudge & Co., Chicago, Coliseum 127-128-146-147.

National Boiler Washing Co., Chicago, Coliseum 12.
National Carbon Co., Inc., Cleveland, Ohio, Coliseum 150-150½-151.
National Highway Crossing Co., Burlington, Ia., Ball Room 247-248.
National Lead Company, New York, Coliseum 113.
National Lock Washer Company, The, Newark, N. J., Annex 192.
National Malleable Casting Co., The, Cleveland, Ohio, Coliseum 102.
National Railway Appliances Assn., Chicago, Annex 198-217.
National Surface Guard Co., Chicago, Annex 224.
National Water Main Cleaning Co., New York, Coliseum 172.
Nichols & Bro., Geo. P., Chicago, Coliseum 173.
Northwestern Motor Co., Eau Claire, Wis., Annex 196-196½.

Ogle Construction Co., Chicago, Coliseum 31.
Ohio Brass Company, The, Mansfield, Ohio, Coliseum 136.
Okonite Company, The, Passaic, N. J., Coliseum 16.
O'Malley-Beare Valve Co., Chicago, Coliseum 114-115.
Otley Paint Mfg. Co., Chicago, Coliseum 161½.
Oxweld Railroad Service Co., The, Chicago, Coliseum 10-11.

P. & M. Co., The, Chicago, Coliseum 122-123.
Page Steel & Wire Co., New York, Coliseum 84.
Pittsburgh-Des Moines Steel Co., Chicago, Coliseum 52½-53.
Pocket List of Railroad Officials, New York, Coliseum 26.
Positive Rail Anchor Co., Marion, Ind., Coliseum 178-179-180.
Protective Signal Mfg. Co., Denver, Colo., Coliseum 3.
Pyrene Manufacturing Co., Chicago, Coliseum 186.

Q & C Co., The, New York, Coliseum 119-120-139.

Rail Joint Company, The, New York, Coliseum 79-80.
Railroad Herald, The, Atlanta, Ga., Ball Room 310.
Railroad Supply Co., The, Chicago, Coliseum 104-105.
Railway Review, Chicago, Coliseum 44.
Ramapo Iron Works, Hillburn, New York, Ball Room 277-278-279-292-293-294.
Rawls Machine & Mfg. Co., Chicago, Annex 210.
Reade Mfg. Co., Jersey City, N. J., Coliseum 156.
Reading Specialties Co., Reading, Pa., Coliseum 81.
Refinite Company, The, Omaha, Neb., Coliseum 184.
Rensselaer Valve Co., New York City, Coliseum 172½.
Richards-Wilcox Mfg. Co., Aurora, Ill., Coliseum 170-170½-171.
Roadmasters and Maintenance of Way Assn., Sterling, Ill., Ball Room Balcony.
Roberts & Schaefer Co., Chicago, Ill., Coliseum 89.
Roberts Co., Geo. J., The, Dayton, Ohio, Coliseum 160½.
Roos Foundries, Inc., Chicago, Ball Room 239.

Safe Lock Switch Machine Co., Lexington, Ky., Coliseum 159.
Sellers Mfg. Co., Chicago, Coliseum 124.
Signal Accessories Corp., Utica, N. Y., Coliseum 118.
Sherwin-Williams Co., The, Cleveland, Ohio, Coliesum 13.
Simmons-Boardman Publishing Co., New York, Coliseum 46.
Simonds Mfg. Co., Fitchburg, Mass., Annex 200-215.
Snow Construction Co., T. W., Chicago, Coliseum 50½.
Southern Hardware & Supply Co., St. Louis, Mo., Coliseum 161-162-162½.
St. Louis Frog & Switch Co., St. Louis, Mo., Ball Room 286-301.
Standard Asphalt & Refining Co., Chicago, Coliseum 185.
Steel Sales Corporation, Chicago, Annex 202.
Stuebing Truck Co., The, Cincinnati, Ohio, Annex 223.
Signal Men's Assn., Chicago, Ball Room Balcony.

Templeton, Kenly & Co., Ltd., Chicago, Coliseum 32.
Toledo Scale Co., Toledo, Ohio, Coliseum 4-5-6.
Track Specialties Co., New York, Ball Room 275-276.
Train Control Appliance Co., El Paso, Texas, Coliseum 164½.
Torchweld Equipment Company, Chicago, Coliseum 149-149½.
Truscon Steel Company, Youngstown, Ohio, Annex 221-222.
Turner, Day & Woolworth Handle Co., Louisville, Ky., Ball Room 237.

Union Switch & Signal Co., Swissvale, Pa., Coliseum 66-67.
U. S. Wind Engine & Pump Co., Batavia, Ill., Coliseum 111-112.

Verona Tool Works, Chicago, Coliseum 129-148.
Volkhardt Co., Inc., Stapleton, S. L., N. Y. C., Coliseum 160.

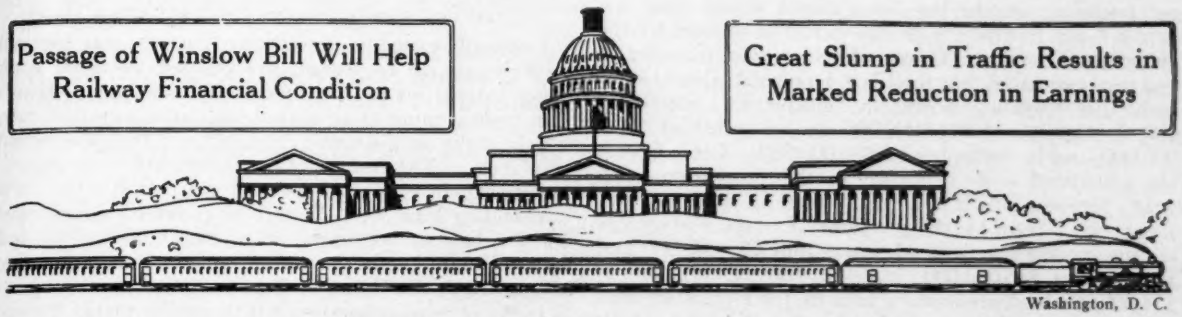
Wailes Dove-Hermiston Corp., Cleveland, Ohio, Ball Room 311-312-313.
Walls Frogless Switch & Mfg. Co., The, Kansas City, Mo., Annex 219-219½-220.
Waterbury Battery Company, The, New York, N. Y., Coliseum 38.
Wayne Oil Tank & Pump Co., Fort Wayne, Ind., Coliseum 144.
Werner Machine Co., West Allis, Wis., Ball Room 261.
West Disinfecting Company, Chicago, Ball Room 263.
Western Electric Co., Inc., New York, Coliseum 58-59.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Ball Room 249-250-251-252.
Wharton, Wm. Jr., & Co., Inc., Easton, Pa., Ball Room 289-290-291-304-305-306.
Woods Bros., Construction Co., Lincoln, Neb., Ball Room 235.
Woolery Machine Company, Minneapolis, Minn., Annex 226.
Wyoming Shovel Works, The, Wyoming, Pa., Coliseum 103.

Yale & Towne Mfg. Co., The, Stamford, Conn., Ball Room 264-265.

RAILWAY AFFAIRS AT THE NATION'S CAPITAL

Passage of Winslow Bill Will Help Railway Financial Condition

Great Slump in Traffic Results in Marked Reduction in Earnings



Washington, D. C.

CONSIDERABLE improvement in the immediate financial condition of the railroads is now expected to result from the passage by Congress of the Winslow bill providing for partial payments on account of the six months' guaranty, pending the final ascertainment of the total amounts due by the Interstate Commerce Commission. The amount of the guaranty for the six months' period is roughly estimated at about $600,000,000, of which $262,000,000 has been paid in the form of advances on applications made by the roads prior to September 1. A large part of the remainder can be made available in a very short time upon certification by the Interstate Commerce Commission to the Treasury Departments of amounts which are certainly due to each carrier, leaving the balance subject to final adjustment. The Winslow bill was passed by the House on February 8. It also passed the Senate on February 22, after the Senate committee on interstate commerce had adopted the form of the bill as it passed the House in place of the form which had been reported by the Senate committee, in order to expedite its passage. The bill was signed by President Wilson on Feb. 26. The bill as passed provides what the railroads and the Interstate Commerce Commission, as well as several members of Congress, who discused it in the debate, thought had been provided when the Tranportation act was passed.

It specifically authorizes the Interstate Commerce Commission, if not able finally to determine the whole amount due under Section 204 or Section 209 of the Transportation act, to a carrier of the American Railway Express Company, to make its certificate for any amount definitely ascertained by it to be due, and thereafter in the same manner make further certificates until the whole amount due has been certified. The authority of and direction to the Secretary of the Treasury under such sections to draw warrants is made applicable to each such certificate. In ascertaining the several amounts payable, the commission is authorized, in the case of deferred debits and credits which cannot at the time be definitely determined, to make, whenever in its judgment practicable, a reasonable estimate of the net effect of any such items and, when agreed to by the carrier or express company, to use such estimate as a definitely ascertained amount in certifying the amounts payable under either of such sections, and such estimates so agreed to shall be prima facie, but not conclusive, evidence of their correctness in amount. The bill originally provided that such estimates should be binding in final settlements, but the language was changed by an amendment offered by Representative De Walt.

In explaining the purpose of the bill, Representative Esch said that the guaranty provision was inserted in the Transportation act because Congress knew that the railroads had not earned their compensation during the 26 months of federal control by hundreds of millions of dollars.

"The guaranty provision is a legal obligation. This bill seeks to permit the payment of what is left unpaid of that guaranty by means of partial payments. The Interstate Commerce Commission, believing that the language of the law we had passed justified partial payments, issued certificates therefor. The Comptroller of the Treasury, however, held that they could not be issued. The result will be a delay of weeks, months and, in some cases, years before settlements can be made. In the meantime, the railroads cannot pay for supplies; the supply people cannot pay their employes. In this bill we simply want to give the Interstate Commerce Commission the right to issue certificates for partial payments and have them honored by the Treasury Department, so that the railroads can get this money, so that unemployment can be reduced, and so that this money can be put into circulation, and so that business may be restored."

Senator LaFollette had offered in the Senate an amendment providing that no payment of money shall be made to any railroad company under the Transportation act until it shall be determined by the Interstate Commerce Commission upon full investigation that the company has not since March 1 paid or contracted to pay unreasonable and extravagant prices for railway supplies, equipment, repairs and renewals charged to its maintenance account, or that it has not paid or agreed to pay unreasonable sums as salaries to its officers or directors, or that it has not otherwise managed and conducted its business in a dishonest, inefficient or uneconomical manner in violation of the terms of the Transportation act.

The Interstate Commerce Commission has already certified and the Treasury Department has paid the final amount determined to be due to one road under the six months' guaranty. This is the Norfolk Southern, which has received $1,311,700 as the amount by which its net operating income for the six months' period fell below one-half of its guaranty for a year during the period of federal control.

Slump in Traffic Reduces Railway Earnings

The expectation that the large increases in rates authorized by the Interstate Commerce Commission in its decision last August would provide the 6 per cent return on the valuation of the railroads as contemplated by the Transportation act has been completely disappointed because of the rapid falling off in the volume of business, which has been reflected in the railroad car loading figures since the latter part of October. While the volume of traffic continued to increase for two months after the new rates were put into effect, during January it has been only about two-thirds of what it was during the fall months. While the railroads have been making every ef-

fort toward economy, the high levels of wages and most other items of expense have continued, and even in spite of the large reductions in forces that have been made, the net operating income has been almost wiped out. To earn a 6 per cent return on the valuation adopted by the Interstate Commerce Commission for rate purposes it has been estimated that the Class I railroads should have had a net operating income in September of $109,000,000, in October of $112,000,000, in November of $99,000,000, and in December of $86,000,000. These figures are calculated with reference to the proportion of a year's business which is normally done in those months. Even with a record-making volume of traffic, the net operating income for September was only $75,000,000 and for October $86,000,000, while in November it fell to $54,000,000, and preliminary returns for December indicate a net operating income for that month of only about $20,000,000. For 188 large roads, whose returns have been filed with the commission for December to date, the net operating income was only $14,807,000. The total operating revenues of those roads had increased 21.6 per cent as a result of the increased rates, but the operating expenses were 20.2 per cent greater than for the corresponding month of 1919.

The railroads have announced that they had no idea of asking for any further increases in rates to meet this condition and have taken the position that the remedy lies in the reduction of expenses, while it is confidently expected that the volume of traffic will soon return to normal condition. The chief item in railway expenses is, of course, wages, and what the railroads will be able to accomplish in this direction largely depends on the result of the proceedings before the Railroad Labor Board at Chicago. Meanwhile the subjects of high rates and the high wages are beginning to receive considerable attention in Congress, and Representative Black of Texas has recently introduced a resolution proposing an investigation by the Interstate Commerce Commission to see if rates cannot be reduced, and a simultaneous investigation by the Railroad Labor Board to see if wages cannot be reduced at the same time.

358,000 Idle Freight Cars

The weekly car loading reports compiled by the Car Service Division of the American Railway Association continue to show a decrease in the total volume of traffic offered to the railways, but this is attributable at present largely to the heavy decrease in the coal movement. Coal production in recent weeks has been only about two-thirds of what it was in November and December, but most classes of traffic except coal and ore have been increasing since the first of the year. The total number of cars loaded with revenue freight for the week ending February 5 was 696,997, or about 3,000 less than the week before, but the coal loading was 20,000 cars less. The loading for the corresponding week of 1920 was 762,680, but in 1919 and 1918 it was even less than for this year, 692,614 and 686,621, respectively. Since the first of the year the loading by weeks has been as follows: 706,413; 709,888; 703,115; 699,936, and 696,997. The peak loading for the past year was during the third week in October, when it was 1,010,000 cars.

Meanwhile the car shortage which prevailed throughout the greater part of last year has long since given way to a car surplus, which for the week ending February 8 had reached the enormous total of 358,065. On September 1 last year there was a shortage of approximately 150,000 cars, but since about the first of November there has been a rapidly increasing surplus. In the spring of 1908 there was a surplus of about 400,000 cars and in the first part of 1919 following the armistice the surplus at one time reached nearly 500,000 cars, but with the exception of those two periods, the present surplus is the greatest on record.

Deficiency Appropriation for Valuation Work

Unusually expeditious action by Congress was required on February 15 to prevent the railroad valuation work being carried on by the Interstate Commerce Commission from coming to an abrupt termination on that date, which is the semi-monthly pay day for the government employees. The Bureau of Valuation had been expending money in excess of its appropriation for the fiscal year ending June 30, 1921, and the commission had asked for a deficiency appropriation of $1,000,000. This had been provided for in the general deficiency appropriation bill passed by the House of Representatives, but Congress is in the state of congestion which usually marks the end of a session, and the bill was still to be finally considered in the Senate. On February 14 Chairman Clark of the commission notified Congressional leaders that unless the appropriation were passed within 24 hours the valuation employees would have to be called in from their work because the funds were exhausted. A special resolution providing for the million-dollar appropriation was promptly put through the House and the Senate with the understanding that the million-dollar item in the general deficiency bill would be eliminated in conference.

The Interstate Commerce Commission has issued a summary of statistics covering employees and their service and compensation for Class I roads for the quarter ending June 30, 1920. This statement indicates the conditions that prevailed before the increase in wages awarded by the Railroad Labor Board on July 20, 1920. The award was retroactive to May 1, but the carriers were instructed in rendering returns not to include any of the back pay for May and June resulting from the decision. The number of employees in service at the middle of the month was 1,952,446 for April, 2,005,483 for May and 2,056,381 for June, or an average of 2,004,760. The total compensation for the quarter was $801,063,938. For the first quarter of 1920 the average number of employees in service was 1,993,524 and the total compensation was $795,616,330.

ANOTHER CHART FOR ESTIMATING TRACK MATERIALS

By C. E. Pfifer

Estimating Engineer, Engineer Maintenance of Way Office, Union Pacific, Omaha, Neb.

In the *Railway Maintenance Engineer* for August, 1920, there appeared an article by H. M. Booth, Jr., assistant engineer on the St. Louis-San Francisco, embodying a chart for estimating track material. This was recognized as a good idea and with a view to its more general application it has been enlarged and elaborated with a few new ideas of the writer's, the result being a chart covering all standard track construction practices of the Union Pacific.

The chart is arranged in the same general form as Mr. Booth's, but differs in not following the Interstate Commerce Commission's order of classification. It is self-explanatory and, as will be noted, is arranged to show the amounts of the various kinds of track material in any length of track up to 1,000 ft., the outer circle being divided to the nearest foot and the inner circles into the smallest unit of material represented by each. By projecting a straight line from any division on the outer circle to the common center, the amounts of track materials in the given length of track may be noted at

each point where this line intersects the interior circles. The table below the chart is to be used in determining quantities of track material in lengths of track over 1,000 ft. Rail joints are shown plus 10 per cent for short rail lengths, but the actual amount can be determined by deducting one-eleventh from the number given. For bolts and nut locks, multiply the number of joints or angle bars by the number of holes in either, as stated by the note in the lower right corner of the chart.

For practical use the chart should be mounted on a stiff piece of cardboard with a hole through the center of the circles. In this hole should be fitted a small metal spindle or pivot, preferably threaded and provided with a small thumb nut. On this pivot place a celluloid arm or index ½ to ¾ in. wide and a trifle longer than the radius of the outer circle. This index should have a fine line cut in it from end to end, thus providing an index which can be revolved to any point on the circumference and the various amounts read off where the line intersects the circles.

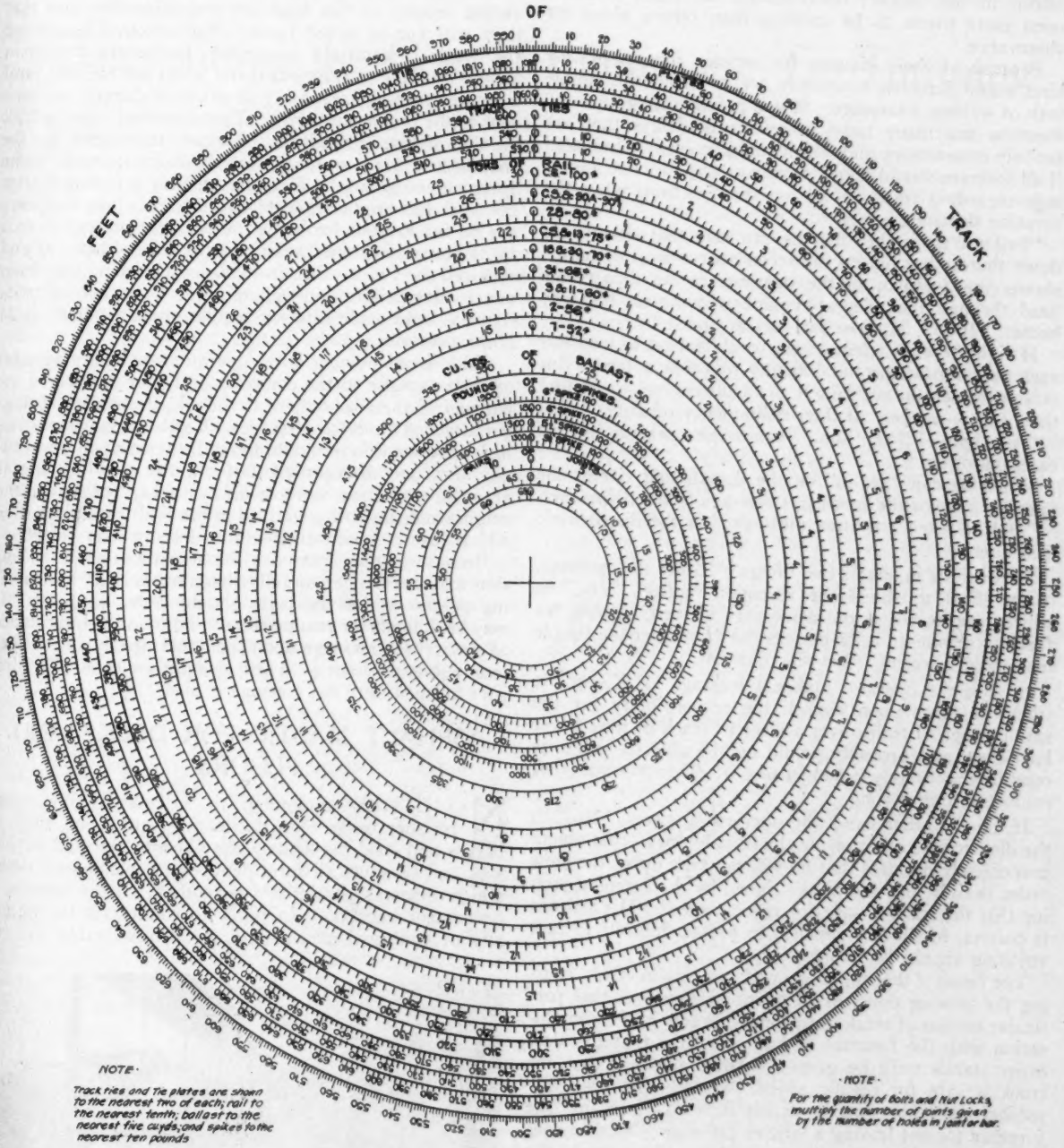

OF
FEET
TRACK.
TIES
TONS OF RAIL
CS-100*
CS & 90A-90*
28-80*
CS & 19-75*
18 & 20-70*
34-66*
3 & 11-60*
2-56*
1-52*
CU. YDS. OF BALLAST.
POUNDS OF SPIKES.
6" SPIKE
5½" SPIKE
5" SPIKE
PAIRS OF JOINTS.
NOTE.
Track ties and Tie plates are shown to the nearest two of each; rail to the nearest tenth; ballast to the nearest five cuyds; and spikes to the nearest ten pounds
NOTE.
For the quantity of Bolts and Nut Locks, multiply the number of joints given by the number of holes in joint or bar.

TABLE TO BE USED IN CONNECTION WITH TRACK CHART
FOR TRACKS LONGER THAN 1000 FEET

LENGTH IN FEET	NUMBER OF TIES			NUMBER OF PLATES			GROSS TONS OF RAIL							CU YDS BALLAST	6" SPIKES		5½" SPIKES		PAIRS OF JOINTS		
	20 TO 33	18 TO 33	16 TO 30	20 TO 33	18 TO 33	16 TO 30	100#	90#	80#	75#	70#	60#	56#		20 TO 33	18 TO 30	18 TO 33	16 TO 30	27 RAIL	30 RAIL	33 RAIL
1000	606	545	535	1092	970	1066	30.2	26.8	23.8	22.3	20.8	17.9	16.7	570	1360	1600	1325	1305	74	67	63
2000	1212	1090	1066	2184	1940	2132	60.4	53.6	47.6	44.6	41.7	35.7	33.3	1140	2720	3200	2650	2610	148	133	125
3000	1818	1635	1599	3276	2910	3198	90.6	80.4	71.4	67.0	62.5	53.6	50.0	1710	4080	4800	3975	3915	222	200	188
4000	2424	2180	2132	4368	3880	4264	120.8	107.1	95.2	89.3	83.3	71.4	66.7	2280	5440	6400	5300	5220	296	267	250
5000	3030	2725	2665	5460	4850	5330	151.0	133.9	119.1	111.6	104.2	89.3	83.3	2850	6800	8000	6625	6525	370	333	313
10000	6060	5450	5330	10920	9700	10660	302.1	267.9	238.1	223.2	208.3	178.6	166.7	5700	13600	16000	13250	13050	740	667	625

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A Convenient Chart

"PUT IT ON PAPER"

BY CHARLES H. SMITH

NOTWITHSTANDING the fact that railroad employees are constantly requested to file a "written report" regarding their work and despite the oft-repeated instructions that verbal messages are not acceptable this precept of railroading is still one of the most commonly violated of rules. All classes of employees offend in this respect occasionally, but track foremen seem more prone to be careless than others about its observance.

Because of their distaste for written reports of any kind many foremen constantly try to avoid the simple task of writing a message. It is a practice altogether too common and many times it results in delays that are entirely unnecessary and which could be easily eliminated if all foremen would take a minute or two to write a message regarding track defects on their sections when the occasion demands a report.

"Tell the dispatcher that he can take that slow order down that he has out on the second curve west of here," shouts the foreman to the operator as he thrusts his head through the telegraph office window on his way home. "It's O. K. now for regular speed."

If right here all telegraphers would refuse to transmit such verbal messages the difficulty would be solved. But most wiremen do not take it upon themselves to remind their fellow-workers of their delinquency of duty.

"All right—I'll tell him," replies the operator in nine cases out of ten.

When he can "get in" on the dispatching circuit the operator repeats the foreman's message to the dispatcher.

"Did he leave a written message?" is the dispatcher's first query.

This results in one of two things: Either the operator, in an effort to shield the foreman, replies, "Yes," in which case he writes out a message himself, signing the foreman's name to it, or he tells the dispatcher the simple truth and answers, "No—he did not."

In case the operator makes a message O. K.-ing the track, he takes upon himself the responsibility for the safe passage of trains over a piece of track he may never have seen and probably would not be able to judge its condition accurately if he had seen it. This practice is, of course, entirely wrong.

If, on the other hand, the operator answers, "No," to the dispatcher's question—as he usually does—that officer immediately declares that he will not take down the slow order until he has a message signed by the foreman stating that the track is safe for regular speed. His attitude is correct, for he is compelled to protect himself in case anything should go wrong.

The result is that the slow order remains in effect, causing the slowing down of all trains passing over that particular section of track until some one gets into communication with the foreman and informs him that the slow order stands until he gives a written message that the track is safe for regular speed. Usually the train dispatcher does not consider it his duty to "jack up" the foreman for not leaving a written message. Neither does the operator think that it is up to him. But usually the operator tries to put things right. If the verbal O. K. has been given at quitting-time and there is no way of communicating with the foreman easily, the order remains in effect until the next morning at least—until the foreman returns to work. And if the operator who was on duty when the foreman quit the night before fails to leave a note regarding the incident to the relieving operator who is on duty when the foreman returns to work nothing is done about taking up the order even then. In this case the slow order remains in effect until the chief dispatcher, the division engineer or the roadmaster, in looking over the copies of slow orders in effect, notices it and wires the foreman and finally gets a written O. K.—and the order is at last annulled. The result in such a case is a delay to many trains—all due to the failure of the foreman to perform a duty which would not have taken him five minutes.

Every foreman knows, or at least should know, that verbal reports of this kind are not acceptable and that they will not be acted upon. The accomplishment of the work is certainly important, but every trackman should be made to realize that the job is not finished until a written message regarding its accomplishment has been sent to the proper authority. This apparently simple task is one of the difficult propositions that confront the roadmaster, for it seems almost impossible to make some foremen recognize the necessity of filing a message after the work has been completed. And so it is that engineers are on the lookout for cattle on the right of way from 6 to 24 hours after the trackmen have driven them off and repaired the fence—that from 40 to 100 trains lose from one to five minutes in passing over a section of track that has been made safe for regular speed from 12 to 24 hours previous.

Aside from slowing down operation—which means increased expense to the company and poor service to the patrons of the road—there is the added element of danger attached to verbal messages. Verbal messages involving track conditions should never be acted upon and usually they are disregarded, but once in a while one is accepted and then there is always a big chance of the original message being garbled in the oral transmission, in which case it is conceivable that disaster may result.

Because of these reasons—the slowing down of operation and the danger to fellow-employees and the traveling public—verbal messages should never be given. It may be difficult for roadmasters to impress the importance of the written message upon their foremen, but nevertheless it should be done. Their slogan should be, "The job isn't finished until the message is filed."

ASPHALT MASTIC FOR DECKS AND FLOORS

NO OTHER equipment of a railroad undergoes rougher usage than its floating equipment, such as barges and steel car-floats. Derailments, unequal expansion and twisting, all form depressions in the steel decks which demand continual overhauling. Rust also is a permanent bugaboo. In order to counteract the necessity of continual overhauling, the Pennsylvania has re-

Applying the Mastic

cently covered ten of its newest steel floats with a flooring of Texaco asphalt mastic. This covering is usually applied to a thickness of from ¾ to 1 in., sticking firmly and expanding and contracting with the steel as the latter expands and contracts with the repeated changes in temperature.

One instance of its use is on Barge 68, belonging to the Pennsylvania. Freight cars ran off the tracks of this barge, cutting holes in the steel flooring and causing it to bulge. In order to repair the damage, the company had asphaltic mastic applied over the flooring, the holes covered thoroughly, and then the entire surface given a 1-in. mat of the mastic.

In doing this class of work the kettles for heating the material, as well as the material itself, were installed on the dock adjoining the barge, while smaller installations were made on the transfer platform of the barge itself. The heated mastic was then distributed by means of buckets to the section to be covered, where it was poured and spread out by the workmen to the desired thickness.

Determining the Cost of Pneumatic Tie Tamping

DUE TO the fact that information as to the cost of tamping ties pneumatically has not been obtainable in any particularly reliable or comparable form, the Delaware, Lackawanna & Western, working in conjunction with the Ingersoll-Rand Company, New York, has recently completeed an eight-weeks' test with that purpose in mind. In conducting this test the Lackawanna furnished all the equipment, including one Ingersoll-Rand four-tool tamping outfit complete with hose and tampers and all of the men with which to do the work. A stretch of main line track was selected between Boonton, N. J., and Lincoln Park.

The officers were confronted at the start with labor difficulties, being unable to secure sufficient men with which to conduct the tests. This matter was overcome by securing the services of a contractor who performed the work of raising the eastbound track between the stations named under the railroad's direction and supervision. In order to secure the necessary laborers who would stay continuously on the job so as not to disorganize the gang or the methods, the contractor found it necessary to pay them at the rate of 55 cents per hour. However, the most desirable and necessary information, that of the time the machine was in actual operation, the number of ties and the lineal feet of track tamped, together with necessary supplies, etc., can be easily adjusted to fit any wage scale.

The Lackawanna required that only such time and other costs be charged as actually applied to the machine and its operation in the performance of its duty of tamping ties, and on that basis the following methods were used. For instance, the machine being a four-tool outfit, four men were used on the "guns" or tampers and their time was charged only when actually employed tamping. The foreman's time was charged only during the period that the machine was in actual operation, while the operator's time was charged for the full day whether or not the machine was in actual use. This was done in view of the fact that it was deemed good policy to have the operator go over his machine carefully and thoroughly when not in operation.

The gang consisted of 40 to 50 men. However, only those actually working with the machine were charged to tamping. Such work as jacking up the track, cleaning the ballast, replacing ballast, putting in new ties equipped with tie plates and screw spikes, were conducted by the remainder of the gang. The ballast consisted of crushed stone of 2½-in. mesh, with 105-lb. rail laid on creosoted ties with tie plates and screw spikes, all of the Lackawanna standard specifications.

The man compiling the data was in no way connected with the operation of the machine nor did he make any repairs and, with the exception of selecting a capable op-

REPORT OF PERFORMANCE OF TIE TAMPING MACHINE

	Ttl. Hours Machine	Total Hours and Cost of Gang						Number	Ft. of Track	Quantity and Cost Used of					
		—Foreman—		—Operator—		—Laborers—		Ttl. Cost	of Ties	—Gasoline—		—Oil—		—Grease—	
Week	Worked	Hours	Cost	Hours	Cost	Hours	Cost	Gang	Tamped	Tamped	Gal.	Cost	Pts	Cost	Lb.	Cost
First	35½	35½	24.50	60	33.00	142	78.10	135.60	1,493	2,643	73	20.08	19	1.33	2	.33
Second	36½	36¼	25.19	60	33.00	146	80.30	138.49	1,498	2,686	82	22.55	20	1.40	2	.33
Third	41	41	28.29	60	33.00	164	90.20	151.49	2,002	3,496	89	24.48	22	1.54	2	.33
Fourth	27½	27½	18.98	60	33.00	110	60.50	112.48	1,186	2,253	60	16.50	14	.98	1¼	.20
Fifth	27¼	27¼	18.80	60	33.00	109	59.95	111.75	966	1,736	61	16.77	15	1.05	1¼	.20
Sixth	26	26	17.94	60	33.00	132	72.60	123.54	992	1,750	54	14.85	15	1.05	1¼	.20
Seventh	22	22	15.18	60	33.00	108	59.40	107.58	825	1,494	52	14.40	13	.91	1¼	.20
Eighth	29¼	29¼	20.18	50	27.50	117	64.35	112.03	1,264	2,300	67	18.43	16	1.12	1½	.25
Total	245	245	169.06	470	258.50	1028	565.40	992.96	10,226	18.358	538	148.06	134	9.38	12½	2.04

	Cost of Operating Machine Exclusive of Repairs				Cost of Op. Machine Incl. Aver. Monthly Cost Rep.			Average Number of Lineal					
Total Hours Machine Idle	Total Cost	Cost Per Tie	Cost Per Lineal Ft. of Track Tamped	Total Cost of Repairs	Total Cost	Cost Per Tie	Cost Per Lineal Ft. of Track Tamped	Number of Ties Tamped Per Hr.	Feet of Single Track Tamped Per Hr.	Quantity Used Per Hour of— Gas. Gals.	Oil Pts.	Grease Lb.	Remarks:
24½	157.34	0.105	0.059	....	157.34	0.105	0.059	42	74.4	2.05	.053	.005	
23½	162.77	0.108	0.060	1.48	164.25	0.109	0.061	41	73.5	2.24	.056	.005	Machine broken on account of dirt.
19	177.84	0.088	0.050	....	177.84	0.088	0.050	48.8	85.2	2.17	.053	.005	
32½	130.16	0.109	0.057	....	130.16	0.109	0.057	43.1	81.1	2.18	.050	.004	
32¾	129.77	0.134	0.074	....	129.77	0.134	0.074	53.4	63.7	2.23	.055	.004	
34	139.64	0.140	0.079	2.00	141.64	0.142	0.080	38	67.3	2.07	.057	.004	Battery exhausted.
38	123.09	0.149	0.082	....	123.09	0.149	0.082	37.5	67.9	2.36	.059	.005	
20¾	131.83	0.104	0.057	....	131.83	0.104	0.057	43.2	78.6	2.29	.054	.005	5 working days— 1 holiday.
225	1,152.44	0.112	0.062	3.48	1,155.92	0.113	0.062	41.7	74.9	2.19	.054	.005	

Foreman 69c per hour — Laborers 55c per hour — Gasoline 27½ cents per gal. — Grease 16½ cents per pound
Operator 55c per hour — Mechanic 85c per hour — Oil 7 cents per pint

erator and instructing him originally in its operation, etc., he had nothing to do with the machine. The operator was not a mechanic and although he was fairly familiar with automobiles, he possessed no particular qualifications with reference to the machine or its operation. The men used on the tampers were all picked at random and were changed about every three or four days so that no specially trained men were used in connection with the operation of the machine or the tampers. In determining the number of ties and the lineal feet of track tamped, owing to the fact that the track was raised as high as 6 in. in many instances, run-offs were necessary and such ties as were tamped in the run-off as well as the lineal feet covered were counted in on the total for the day.

Throughout the duration of the entire test, which covered eight consecutive weeks, the tamping outfit was out of service 2½ hr., of which 1 hr. was due to the battery being exhausted and time consumed in waiting for a renewal, while the remaining 1½ hr. was due to dirt and water, making it necessary to remove and clean the carburetor and feed pipe. All the time so consumed was charged against the machine.

A summary of the results as given in the table shows that for the eight weeks' run the average cost for tamping, all items included, was 11.3 cents per tie, or at the rate of 6.2 cents per lineal foot of track. A comparison of the separate weeks brings out very markedly the necessity for maintaining as near as possible an unbroken continuity of work. This is most strikingly shown by a comparison of the time consumed, the work performed and the unit cost during the third week with that of the seventh week. The figures taken are the two extremes, but it will be noted that with the men working 164 hr. and the foreman 41 the cost was 8.8 cents per tie as against a cost of 14.9 cents per tie where the gang worked only 108 hr. and the foreman 22 hr. Part of this difference in cost is due to the fixed charge of the operator, this charge being carried whether the machine was in operation or not. The results or average cost obtained, that is, 11.3 cents per tie, may be safely used in determining a ratio whereby estimates of cost may be made on the basis of any wage scale.

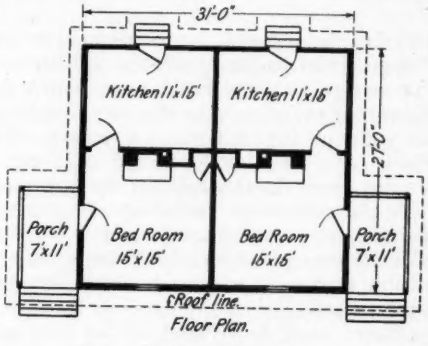
To determine a fair comparison or equation it is necessary to separate the average total cost into its component parts and to then reduce each part into its determining factors. These factors consist of a constant which, multiplied by the wage scale will give the cost per tie for that particular item of the total cost. In reducing the total cost of $1,155.92 for tamping 10,226 ties or 18,358 lineal feet of track, it will be found that this is made up as follows:

Items	Cost	Per Cent	Cost per Tie	Constant
Foreman	$169.06	14.62	1.65	0.024 x wage
Operator	258.50	22.36	2.53	0.046 x wage
Labor	565.40	48.90	5.52	0.103 x wage
Gasoline	148.06	12.82	1.45	0.053 x price
Oil	9.38	0.81	0.10	
Grease	2.04	0.18	0.02	
Repairs	3.48	0.31	0.03	
Total	$1,155.92	100.00	11.3 cents	

The constant as shown in the right-hand column consists of the figure which, multiplied by the wage scale of the man or men doing the work of tamping, will give the cost per tie for tamping by compressed air. For example, with a foreman receiving $5.27 per day, or 66 cents per hr., with labor at 46.4 cents per hr. and gasoline at 27½ cents per gal. the proportionate cost per tie would be 0.024 times 66 or 1.58 cents; 0.046 times 46.4 or 2.12 cents; 0.103 times 46.4 or 4.78 cents, and 0.053 times 27.5 or 1.45 cents. This adds up to 9.93 cents to which should be added 0.15 cents for oil, grease and repairs, this cost remaining practically the same with the machine in good order. The result is a total cost of 10.08 cents per tie for tamping pneumatically or on a basis of 20 ties per rail length a cost of 6.11 cents per lineal foot. Other wage scales may be substituted in the manner outlined and the basic cost for any particular piece of work derived.

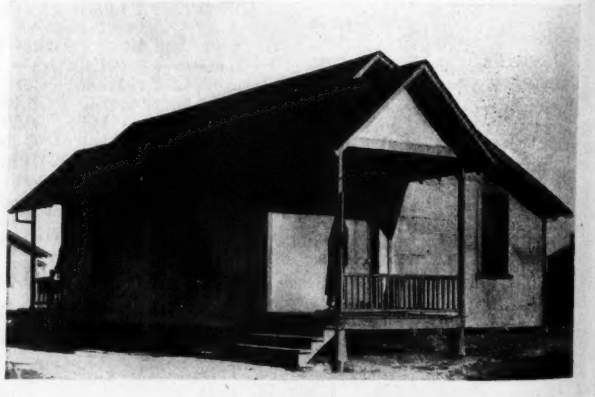
STUCCO HOUSES FOR TRACK MEN

THE NASHVILLE, Chattanooga & St. Louis is building section laborers' houses with an exterior covering of stucco which has proven both economical and serviceable. In one instance two houses were moved 300 ft. after having been completed without any injury to the stucco other than some slight abrasions where the sills rested on the skids. As shown on the plan, these houses are divided into four rooms, forming two apartments of two rooms each. By leaving off one of the porches and cutting two doors through the central partition, the same plan of house is supplied as a four-room dwelling for the section foremen.



Plan of the Double House

The studding is applied over tar paper and wire mesh, the framing conforming otherwise to the usual wooden frame construction. The exterior trim, including the corner boards, porches, etc., is of red cypress lumber. The interior is sheathed complete with ½-in. beaded ceilings. The floors are composed of ⅞-in. poplar or No. 1 common pine on 2-in. by 10-in. joints supported on 6-in. by 10-in. sills, these sills being either pine or white oak. The house rests on pile caps of oak or creosoted pine. The roof covering is composition shingles. Each house is provided with a fireplace designed to burn old crossties.



One of the Houses Built

We are indebted for the above information to Hunter McDonald, chief engineer, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

HAVE YOU a problem which is troubling you? Has some question arisen for which you would like to know the answer? If so, send it to us for publication, for among our large circle of readers are some who can answer it. This column is dedicated to our readers. We hope that you will avail yourselves of it to ask those questions for which you desire an answer and also to answer those raised by other readers. The only conditions are that the questions must relate to maintenance of way work and the communications must bear the name of the author.

To afford ample time for our readers to study and answer the questions submitted, the answers will appear in the second issue following the date of publication.

The following questions which were published in the January issue are repeated here with the answers which have been submitted:

DETECTION OF PIPED RAILS

How may piped rails in track be most certainly detected through visual inspection?

As there is no way to detect a pipe in a new rail until it has been laid in track and the traffic put on it, we are dependent upon the pipe being opened up and brought to the surface under wheel loads. The pipe can then be detected if the observer will watch closely, for a dark streak will appear on the top of the ball approximately along the center, as a result of the piped part giving away so that it does not get the wheel wear and turns dark. This is the first sign of piped metal in the ball. If a rail so marked is allowed to remain in track it will usually break off at the top of the web and under the ball. In some cases it will break at the latter point before it shows up defective on top. Such cases can usually be detected if the observer will watch the web and base carefully for an unusual rusty or brownish color where water has passed through the invisible break and left a stain on the rail base and web that is noticeably different from the ordinary weather coloring of the rail. I have watched this matter closely and in several cases have found concealed breaks under the ball that otherwise would hardly have been found.

J. MORGAN,
Supervisor, Central of Georgia, Goodwater, Ala.

Questions to be Answered in the May Issue

The following questions have been submitted and will be answered in the May issue:

(1) What is the least time in which a trackman of average intelligence can qualify as a foreman?

(2) What is the best way to patch or replace a piece of concrete knocked out of a parapet wall, a column, etc.?

(3) What types of floors are the most sanitary and practical in maintenance for station toilet rooms?

(4) How can a leak be stopped in the joint between the staves of a wooden tank tub?

BOLTING STRINGERS TO THE CAPS

"Should trestle bridge stringers be bolted to the cap?"

FIRST ANSWER

I think that by all means trestle bridge stringers should be bolted to the caps. This makes a more rigid structure, tending to cause less loosening up and raveling out of the structure as a whole, and also serves to hold the bents firmly in place under the stringer joints, and to hold the stringers properly in line on the bents. If stringers are placed on bents without fastening them to the caps, the movement of the trestle under passing trains tends to move the stringers out of line, and also tends to move the bents out from under the stringer joints. In many cases of pile trestles especially it is necessary to pull bents into correct position in the structure, and if the stringers are not bolted to the caps the bents will soon spring out from under the stringer joints.

In frame trestles there is generally not so much tendency of the bent to *spring* out from under the joint, but there is always a tendency of bents to move from their original position unless they are fastened to the stringers. In case of trestles over streams, where the water is liable to rise high enough to reach the stringers, the stringers and ties are liable to be floated off during high water unless the stringers are bolted to the caps.

In cases where it is necessary to pull very hard to bring the bents into proper location in the trestle, it may be desirable to use two bolts through each stringer of the cap, although under ordinary conditions one bolt through each chord and each cap, when kept properly tightened up, is sufficient to hold the bents and stringers firmly in place.

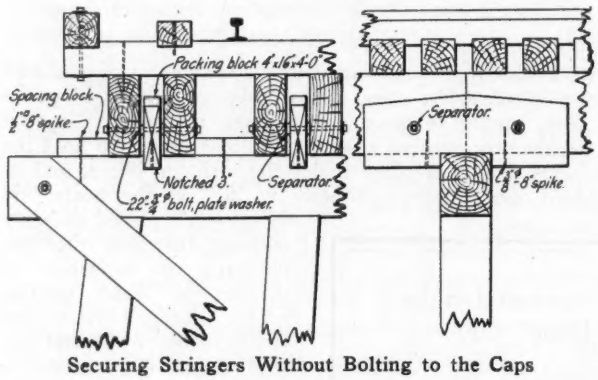
R. H. REID, Supervisor of Bridges, New York Central, Western Lines, Cleveland, Ohio.

SECOND ANSWER

It is absolutely essential that bridge stringers should be fastened to the caps in some substantial and effective manner, but it is not essential that they be bolted directly to the caps. If a good fastening were not pro-

vided the stringers would have a tendency to creep or vibrate out of place and if the bents, either frame or piles, had any crowding tendency, brought about by slipping dumps, uneven pressure of longitudinal braces, tower braces, derailment or any other cause, the caps could be pushed out of place if not fastened to the stringers. It is also essential that the stringers should be bolted together in pairs or more, so they will be in a solid chord from end to end of bridge and butted up against a good solid ballast wall.

There are several methods of fastening stringers to caps, such as putting bolts through the stringers and caps, drift bolts through stringers and part way through caps, etc., each of which would appear to be equally effective so far as safety is concerned, but from a combined viewpoint of safety, and easy maintenance, the writer favors the plan adopted by the Canadian Northern some 18 years ago, which has proven successful under all conditions, and is still being used.



Securing Stringers Without Bolting to the Caps

The stringers extend over two spans and are laid in pairs with joints broken. Between each pair of stringers over the cap is placed a spacing block 4 in. by 16 in. by 4 ft. long. This block is dapped out 3 in. deep and set over the cap, the spacing block and the two stringers are then bolted together with two ¾-in. bolts. There are cast spacing washers ¾ in. thick placed between the block and the stringers to prevent decay. The stringers are prevented from moving sideways by spiking short pieces of 4-in. by 6-in. blocks to the cap between each pair of stringers.

J. A. CRAWFORD, Bridge and Building Master, Canadian National, Saskatoon, Sask.

PREVENTING DRY ROT

What can be done to avoid dry rot in floor timbers of a building set close to the ground but not provided with a basement?

When a piece of timber reaches that condition where it will crack and crumble into small fragments and is completely dried out and lifeless, we say it is affected by "dry rot." Dr. Dudley explains that "dry rot" is an erroneous term and that this condition is due to the effect on the wood of the mycelium of a fungus, which breaks down the wood cells. Its growth requires moisture, air and a temperature above freezing. Where moisture has been practically eliminated, as in dry, well-ventilated buildings, timber has been found in good condition after more than 1,000 years; where air is eliminated, such as in the case of timber under water, no decay takes place, and it is also known that fungus growth is held back by temperatures near or below freezing.

Therefore for frame buildings, set close to the ground and not provided with a basement, ventilation for the space between the ground and the floor should be provided by means of window openings in opposite sides of the foundation. These openings should be large enough to allow for free circulation of air and should be covered by suitable wire netting. When the temperature is below freezing, if a cold floor is objectionable, windows may be placed in such openings.

Where such ventilation has not been provided it has been noted where the floor beams of a new building were completely decayed in less than three years and fungus growth has been known to start under favorable conditions within six weeks. Conditions for fungus growth are particularly favorable where a structure is supported by a tight masonry foundation, but even where the base of the building is merely surrounded by tight board skirting, suitable openings should be provided on two sides to allow for free circulation of air.

E. M. GRIME, Supervisor, Northern Pacific, Fargo, N. D.

POUNDING PUMPS

How can pounding in a pump be prevented?

Pounding in pumps is usually caused by the surge of the water. If the pump is in first-class condition, pounding can be prevented by installing air chambers on the suction and discharge lines. If the pump is not filled completely, more water should be made available. If the pump is not in first-class condition the valves should be overhauled and also the piston rods and plungers should be repacked and the follower plates tightened to eliminate all air leaks.

R. C. BARDWELL, Engineer Water Service, Missouri Pacific, St. Louis, Mo.

KEEPING SHIMMED TRACK SAFE

(The following is a further answer to a question answered in the February issue:)

How can the higher shims be braced to insure complete safety?

How to brace high shimmed track properly is very important work on northern railroads where conditions of traffic are such that it will not warrant the expenditure of a sufficient amount of money for ballast and drainage to prevent heaving, but on roads of high speed and heavy traffic steps should be taken to eliminate the necessity of at least high shimming and the time and money expended for material and labor to shim track for two or three winters amount to enough to remove the cause of track heaving.

The cost of removing the cause of heaved track is not excessive in most cases; therefore, this matter should be given careful consideration, but there is no case where the old adage will apply as well as here, "That an Ounce of Prevention Is Worth Ten Pounds of Cure," for high shimmed track requires careful and constant attention until the shims are removed. Track must be tested frequently with the gage and level board. Shims of over one inch in thickness should be at least 6 in. wide and should be not less than 15 in. long. They should be bored and placed lengthwise of the ties. They should be securely fastened to the tie with spikes, independent of those holding the rail. Frost spikes eight inches long, or longer if necessary, should be used for shims from one inch upward. Care should be taken that shims have a full even bearing upon the tie, adzing the tie where necessary.

For shims two or three inches high, planks of the proper thickness should be spiked the entire length of the ties. Rails should also be braced so as to prevent any possibility of the track spreading. Braces should be placed at such an angle that their ends will embed

in the tie and not at such an angle that it will work loose from the outward pressure exerted by moving wheels. For light shimming, intermediate tie plates make a very good brace by placing one end against the outside of the ball of the rail and embedding the other end in the end of the tie and spiking securely. For thicker shims requiring longer braces, side joint and center joint tie plates can be used to good advantage.

If shims are of such a height that tie plates are not long enough, old fish plates, cut or broken to the proper length, make a fairly good brace, but where planks are spiked on the ties, ordinary guard rail braces can be used to good advantage. It is sometimes advisable to put tie rods on shimmed track to avoid any possibility of spreading.

In spots where it is frequently necessary to do high shimming it is a good practice to remove a portion of the ballast from between the ties before the ground is frozen in the fall, care being taken to keep the bottom of this trench perfectly level, so that after shims two or three inches thick are installed a six-inch sawed tie may be placed between the track ties. These ties, when properly installed, make shimmed track perfectly safe, as it is possible to spike and brace them without using any shims between them and the rail, and if it becomes necessary to use thicker shims, blocks may be put underneath the new ties installed to keep them up to the rail, but of course such ties must later be removed from the track with the shims.

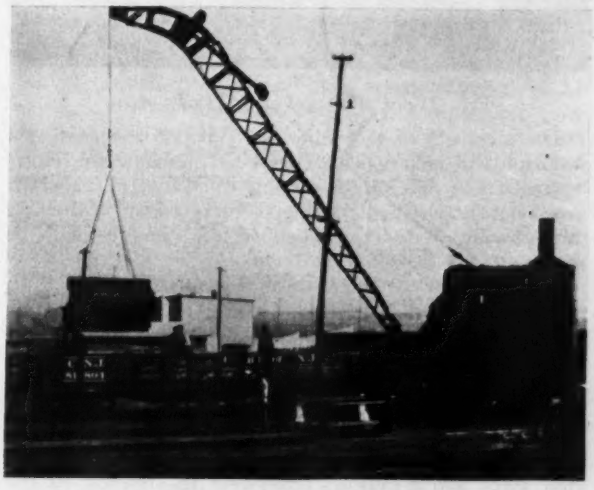
J. W. POWERS, Track Supervisor, New York Central, Rochester, New York.

LOADING AND UNLOADING TIES ECONOMICALLY

THE CENTRAL of New Jersey has developed a method of loading and unloading crossties by means of cable slings that has resulted in considerable advantage. Cars have been released quicker for other loading, less delay has been caused on the main line and the morale of the men doing this class of work has been greatly improved.

The method consists primarily of handling the ties in solid bundles by means of looped cables and locomotive cranes, etc. Old or second-hand cables measuring ½ in. to ¾ in. in diameter are used for this work, being reclaimed by cutting them into 25-ft. lengths, after which each end is spliced into a loop. They are then shipped to the creosoting plant, preferably in carload lots, where they are stored and used as needed. During the past season with its general shortage of ties, they have been shipped almost entirely direct from the retort. Under these circumstances two cables are run around the ties as they come out of the retort on the tram car. A crane operating at the tie plant picks up the entire load (averaging approximately 40 ties) by means of the two cables and lowers it into the waiting open-top car or gondola. The cables are then unhooked and one end or loop pulled through the other, after which they are left with the bundles. In this manner an average of from four to six bundles per car, or approximately 230 to 260 ties, are loaded in not over 15 minutes. In such cases where the ties are loaded from storage piles to cars or where the crane cannot load a full bundle at one move, or where it cannot be used at all, the cables are laid across the bottom of the car, the ends extending over the sides and the ties loaded in any manner found necessary under the circumstances. With the completion of the loading the cable ends are looped as before and the cars sent out.

In unloading, a crane is placed between two loaded cars and the work train moves out over the line to the point where the ties are needed. The cars are generally accompanied by a section foreman who directs the unloading and designates the exact spots where he wishes the ties to be placed. The crane picks up a bundle by means of the cable loops and swings it out to the side of the right-of-way where the ties may be left for future work



The Ties Are Quickly and Easily Placed in the Car

or distributed as needed. The cables are removed, collected, and as soon as a sufficient number have accumulated on a supervisor's district they are loaded and shipped back to the treating plant.

The time saved by this method has been a large item and in general has resulted in a much lower cost for tie handling. For example, four cars containing 889 ties were unloaded in a total expired time of 63 minutes and at a total cost of $12.95, or 1.46 cents per tie. The unloading of the four cars at this instance necessitated running to the nearest siding in order that the first two empties could be shifted and the remaining two loaded cars placed at each end of the crane. In comparison, four cars containing 807 ties were unloaded without slings by 10 men working 4½ hours at a cost of 5.5 cents per tie. As a rule, only a foreman and three men are needed where slings are used and it has been found that where the wet creosoted ties do not have to be handled by hand these men work more willingly and with far better results.

The Slings Left in Place to Facilitate Unloading

THE WOOD PRESERVERS' ASSOCIATION

The members of the American Wood Preservers' Association will hold a "Get-Together" dinner at the Hotel Sherman, Chicago, on the evening of March 15, at which time photographs and moving pictures taken on the trip through the Western timber region recently will be shown.

THE ROADMASTERS' ASSOCIATION

Taking advantage of the fact that many roadmasters will be in Chicago during the week of March 14 to attend the exhibit of the National Railway Appliances Association and the convention of the American Railway Engineering Association, arrangements are being perfected for the officers of the association and the members of committees to meet on the evening of March 16 to discuss ways and means of promoting the interest of the organization, particularly through aggressive prosecution of committee work.

AMERICAN RAILWAY ENGINEERING ASSOCIATION

The plans for the twenty-second annual convention, which will be held at the Congress hotel, Chicago, on March 15-17, inclusive, are now practically completed, and indications point to a large attendance. The reports have been printed and mailed to the members earlier this year than in 1920, a feature which should contribute to more thorough discussion. Seventeen of the 24 reports were mailed over three weeks prior to the convention.

The program for the convention is as follows:

TUESDAY, MARCH 15

President's address.
Reports of secretary and treasurer.
Report of committees on
- Signals and Interlocking,
- Ballast,
- Stresses in Railroad Track,
- Electricity,
- Track,
- Rail,
- Standardization,
- Uniform General Contract Forms.

WEDNESDAY, MARCH 16

- Signs, Fences and Crossings,
- Ties,
- Iron and Steel Structures,
- Water Service,
- Economics of Railway Labor,
- Economics of Railway Operation,
- Economics of Railway Location,
- Shops and Locomotive Terminals,
- Buildings.

Annual dinner at 6:30 p. m. Two of the speakers are John F. Wallace, consulting engineer, New York City, and Dr. David Kinley, president University of Illinois.

THURSDAY, MARCH 17

- Masonry,
- Roadway,
- Wood Preservation,
- Wooden Bridges and Trestles,
- Yards and Terminals,
- Rules and Organizations,
- Records and Accounts,
- Conservation of Natural Resources.

Election and installation of officers.

THE BRIDGE AND BUILDING ASSOCIATION

A meeting of the Executive Committee will be held in Chicago during the week of March 14, at which time a progress report will be received from the committee appointed to arrange for the next convention, which will be held in New York city next October.

The proceedings of the last annual convention are now in the hands of the printer and it is expected that they will be completed ready for distribution during March. The committees have been selected and subjects assigned as follows:

Tool Equipment for Pile Driver Outfits—J. A. Bohland (chairman), brg. engr., G. N., St. Paul, Minn.; G. W. Andrews, asst. m. of w. dept., B. & O., Baltimore, Md.; T. W. Bratten, supv. b. & b., S. P., Oakland Pier, Cal.; A. J. Catchot, supv. b. & b., L. & N., Ocean Springs, Miss.; W. R. Gants, mast. carp., Penna., Philadelphia, Pa.; Maro Johnson, asst. engr., I. C., Chicago; Harry James, gen. for. b. & b., C. & S., Denver, Colo.; G. W. Land, supv. b. & b., M. P., McGehee, Ark.; K. Peabody, supv. piers & bldgs., N. Y. C., New York; R. C. Young, chief engr., L. S. & I., Marquette, Mich.

Recruiting of Bridge and Building Employees—F. W. Hillman (chairman), div. engr., C. & N. W., Chicago; J. E. Buckley, supv. b. & b., B. & M., Fitchburg, Mass.; J. K. Davidson, mast. carp., Penna., Jamestown, Pa.; E. A. Jackson, for. b. & b., M. P., McGehee, Ark.; A. A. Kurzejka, ch. carp., C. M. & St. P., Minneapolis, Minn.; Frank Lee, engr. m. of w., C. P. R., Montreal, Que.; M. E. Nelson, engr. brg., A. C. L., Wilmington, N. C.; S. L. McLanahan, div. engr., C. R. I. & P., Herington, Kan.; E. G. Storck, mast. carp., P. & R., Philadelphia, Pa.; M. R. Williams, gen. for. b. & b., A. T. & S. F., Las Vegas, N. M.

Effect of the Eight-Hour Day—E. T. Howson (chairman), editor *Railway Maintenance Engineer*, Chicago, Ill.; G. E. Boyd, div. engr., D. L. & W., Buffalo, N. Y.; W. M. Camp, editor Railway Review, Ellsworth Bldg., Chicago, Ill.; G. W. Hand, asst. to prest., C. & N. W., Chicago, Ill.; F. G. Jonah, ch. engr., St. L.-S. F., St. Louis, Mo.; W. A. McGonagle, prest., D. M. & N., Duluth, Minn.; A. Montzheimer, ch. engr., E. J. & E. Ry., Joliet, Ill.; R. H. Reid, supv. br., N. Y. C., Cleveland, O.; C. A. Sibley, engr. & contr., 902 Chapel St., New Haven, Conn.; E. E. R. Tratman, editor Eng. News-Record, Old Colony Bldg., Chicago, Ill.

Detection and Repairs of Leaks in Water Mains—J. H. Grover (chairman), for. w. s., A. T. & S. F., Needles, Cal.; C. Bugg, supv. w. s., G. T., Lodon, Ont.; T. W. Bussier, plumb. for., B. & A., Pittsfield, Mass.; H. Heiszenbuttel, supv. b. & b., C. & N. W. Norfolk, Neb.; J. A. Hutchens, gen. for. w. s., S. P., Ogden, Utah; E. H. Johnson, for. plumb., Erie, Elmira, N. Y.; W. E. Keir, gen. for. w. s., A. T. & S. F., San Bernardino, Cal.; J. Mellgren, for. w. s., C. & N. W., Eagle Grove, Iowa; Wm. Smith, for. w. s., C. & N. W., McGehee, Ark.; G. Y. Whitmee, for. w. s., P. M., Grand Rapids, Mich.

Cleaning of Structural Steel Before Painting—Chas. Ettinger (chairman), gen. ptr. for., I. C., Chicago; E. S. Airmet, for. ptr., O. S. L., Salt Lake City, Utah; O. F. Dalstrom, brg. engr., C. & N. W., Chicago; F. O. Draper, supt. of brg., I. C., Chicago; H. H. Harman, engr. brg., B. & L. E., Greenville, Pa.; H. R. Leonard, engr. b. & b., Penna., Philadelphia, Pa.; C. R. Lyman, for. brg., C. Vt., Waterbury, Vt.; R. E. Miller, brg. engr., St. L.-S. F., St. Louis, Mo.; John O'Connell, ptr. for., B. & A., Pittsfield, Mass.; B. D. Rich., ptr. for., S. P., Stockton, Cal.

Construction and Maintenance of Cinder Pits—G. K. Nuss (chairman), gen. for. b. & b., D. M. & N., Proctor, Minn.; C. L. Beeler, asst. engr., N. Y. N. H. & H., New Haven, Conn.; W. M. Cardwell, supv. b. & b., W. T., Washington, D. C.; H. A. Gerst, asst. br. engr., G. N., St. Paul, Minn.; A. E. Kemp, for. b. & b., L. V., Hazelton, Pa.; H. McDonald, ch. engr., N. C. & St. L., Nashville, Tenn.; W. L. Rohbock, ch. engr., W. & L. E., Cleveland, Ohio; F. E. Schall, brg. engr., L. V., Bethlehem, Pa.; E. R. Wenner, supv. b. & b., L. V., Ashley, Pa.; J. P. Wood, supt. b. & b., P. M., Saginaw, Mich.

Lining Tunnels Under Traffic—W. C. Harman (chairman), brg. insp., S. P., Bakersfield, Cal.; M. M. Corrigan, gen. insp. tunnels, B. & O., Cumberland, Md.; R. D. Garner, engr. of const., S. N. E., Providence, R. I.; James Gratto, supv. b. & b., S. P., Los Angeles, Cal.; Geo. W. Rear, gen. brg. insp., S. P., San Francisco, Cal.; A. Ridgway, asst. chief engr., D. & R. G., Denver, Colo.; H. B. Rivers, ch. carp., C. M. & St. P., Deer Lodge, Mont.; A. W. Robinson, div. engr., O. S. L., Pocatello, Idaho; C. S. Thompson, supv. b. & b., D. & R. G., Denver, Colo.; J. W. Wood, gen. for. b. & b., A. T. & S. F., San Bernardino, Cal.

Construction and Maintenance of Passenger Platforms—E. K. Barrett (chairman), supv. b. & b., F. E. C., St. Augustine, Fla.; E. E. Allard, for. b. & b., M. P., St. Louis, Mo.; R. W. Beeson, mast. carp., C. & S., Trinidad, Colo.; A. O. Cunningham, ch. engr., Wabash, St. Louis, Mo.; Geo. Dickson, for. brg., S. P., Oakland, Cal.; F. A. Eskridge, architect, C. & E. I., Chicago; J. H. Markley, mast. carp., T. P. & W., Peoria, Ill.; H. Silcox, mast. carp., Penna., Jersey City, N. J.; F. J. Welch, ch. carp., C. M. & St. P., Tacoma, Wash.; J. J. Wishart, supv. b. & b., N. Y. N. H. & H., Boston, Mass.

NATIONAL SCALE MEN'S ASSOCIATION

Among other features of the week of March 14 at Chicago will be the sixth annual meeting of the National Scale Men's Association. An interesting program has been prepared, a large part of which consists of papers by railway scale men. The annual dinner will be held Wednesday noon and all of Wednesday afternoon will be devoted to the Railway Appliances Exhibit. The program is as follows:

TUESDAY, MARCH 15

10:00 a. m.

Address of welcome by Joseph P. Griffin, president, Board of Trade of Chicago.

President's address by B. B. Gordon, general scale inspector, Pennsylvania System.

1:30 p. m.

Motor Truck Scales, by Charles B. Barackman, scale inspector, C. R. I. & P.

Address by William F. Cluett, chief deputy inspector, Department of Weights and Measures, City of Chicago.

Standards, by Dr. S. W. Stratton, director, United States Bureau of Standards.

Automatic Indicating Scales, by E. D. Gordon, sales engineer, General Automatic Scale Company.

Repairing Counter and Portable Scales, by A. R. McFarlane, scale inspector, C. B. & Q.

The Testing and Inspection of Industry-Owned Scales, by C. H. Mann, superintendent of scales, Southern.

WEDNESDAY, MARCH 16

9:30 a. m.

The Scale Inspector's Relation to Scale Sales, by L. R. Boyer, sales engineer, Fairbanks, Morse & Co.

Official Supervision of Grain Weighing at Terminal Markets, by James T. Bradshaw, grain warehouse commissioner of Missouri.

Scales and Weighing from the Viewpoint of a Railroad Engineer, by R. Hayes, structural engineer, Southern.

Weights and Weighing from a Freight Agent's Standpoint, by H. C. Howe, freight claim agent, C. & N. W.

Weights on Grain Shipments from the Standpoint of the Country Shipper, by George A. Wells, secretary, Western Grain Dealers' Association.

Scale Specifications and Requirements of Interstate Commerce Commission Docket 9009, by Henry L. Goemann, president, Goemann Grain Company.

Address by H. A. Foss, weighmaster, Chicago Board of Trade.

THURSDAY, MARCH 17

9:30 a. m.

Linear Measurements; the Basis of all Metrological Standards, by Charles C. Neale, the Measuregraph Company.

Address by A. B. Jacobus, president, Strait Scale Company.

The Present Status of the Grain Scale Situation, by C. A. Briggs, United States Bureau of Standards.

The Proper Use of Cement and Concrete by Professor Duff A. Abrams, Structural Materials Research Laboratory.

Method of Computing Fiber Stresses, by H. O. Hem, consulting engineer, Toledo Scale Company.

Design of Weigh Bridges, by James L. Miller, engineer of bridges, N. Y. C.

Testing Mine Scales, by L. A. Fischer, United States Bureau of Standards.

1:30 p. m.

Testing Hopper Scales Under Normal Working Conditions as Compared with the Results of Shut-Down Tests, by G. O. Aws, chief scale inspector, Missouri State Weighing Department.

Waterproof Decks for Railroad Track Scales, by John E. Armstrong, assistant engineer, Canadian Pacific.

Shop Treatment of Steel for Scale Pivots, by A. Malmstrom, chief scale inspector, A. T. & S. F.

Errors in Scale Weighing Beams, by W. E. Thompson, supervisor of scales, Minnesota Track and Hopper Scale Department.

Protecting Structural Steel Against Corrosion, by C. Pettis, general scale inspector, N. Y. C.

Waterproof Pits and Scale Drainage, by T. O. Dean, superintendent of scales, T & P.

Address by R. C. Welsh, scale inspector, Pennsylvania System.

THE MATERIAL MARKET

THE story of the iron and steel market for the month of February is of distinct interest as recording the first definite breaks below the prices established by the United States Steel Corporation. The present situation is in direct contrast to that prevailing before the current depression became effective in that whereas the independent manufacturers maintained prices above those of the steel corporation, these same companies are now quoting prices below those of the leading steel interest and in the table of prices given below it will be noted that two quotations are given for a number of items, the lower figure indicating in a general way how much some of the prices have fallen below the standard. No cuts in price have been shown for track materials because thus far none of these reductions have been sufficiently definite to warrant listing.

	Prices in Cents Per Pound			
	January 20		February 29	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$3.65	$4.03	$.... to $3.65	$.... to $4.03
Track bolts	....	4.98	....	.... 4.98
Angle bars	2.75	2.75	.... 2.75	.... 2.75
Tie plates, steel	....	3.00	....	2.75 3.00
Tie plates, iron	....	3.00	....	.... 3.00
Plain wire	3.25	3.63	3.00 to 3.25	.... 3.63
Wire nails	3.25	3.63	3.10 to 3.25	.... 3.63
Barbed wire, galv.	3.95	4.33	3.45 to 3.95	.... 4.33
C. I. pipe, 6 in. or larger (per ton)	....	64.10	....	.... 64.10
Plates	2.65	3.03	2.25 to 2.65	2.63 to 3.03
Shapes	2.45	2.83	2.20 to 2.45	2.63 to 2.83
Bars (steel)	2.35	2.73	2.10 to 2.35	2.35 to 2.73

There has been but little change in the scrap market, some items being lower and others higher.

	Per Gross Ton	
	Chicago	St. Louis
Relaying rails	$37.50 to $40.00	$35.00 to $40.00
Rerolling rails	15.50 to 16.00	16.00 to 16.50
Rails less than 3 ft. long	16.50 to 17.00	14.50 to 15.00
Frogs and switches, cut apart	15.00 to 15.50	14.00 to 14.50
	Per Net Ton	
No. 1 railroad wrought	13.50 to 14.00	13.00 to 13.50
Steel angle bars	14.50 to 15.00	12.50 to 13.00

In last month's lumber price it was noted that prices of Douglas fir had remained stationary, while those for Southern pine had declined from $0.50 to $3. This month we find the reverse is the case, the prices of Southern pine averaging about the same, while those for Douglas fir dropped from $2 to $6.

Southern Pine Mill Prices

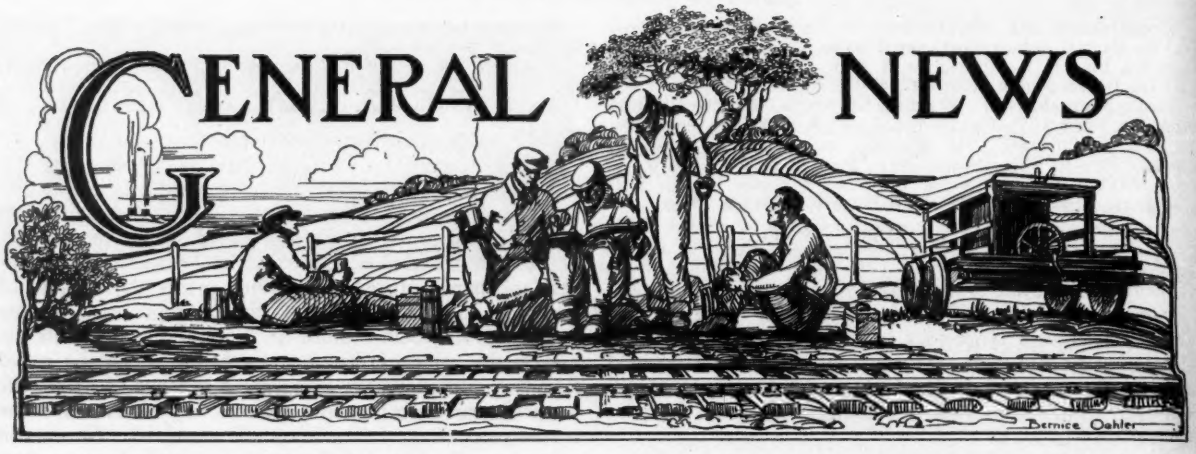
	January	February
Flooring, 1 x 4, B. & B., flat	$37.85	$34.84
Boards, 1 x 8, 14 & 16, No. 1	28.50	30.61
Dimension, 2 x 4, 16, No. 1	20.31	21.72
Dimension, 2 x 10, 16, No. 1	20.31	21.53
Timbers, 4 x 4 to 8 x 8, No. 1	26.76	24.93
Timbers, 3 x 12 to 12 x 12, No. 1	37.50	32.75

Douglas Fir, Seattle Prices

Flooring, 1 x 4, No. 2, clear, flat	$29.00	$23.00
Boards, 1 x 6, 6 to 20, No. 1, common	16.50	13.50
Dimension, 2 x 4, 16, No. 1, common	15.50	13.50
Dimension, 2 x 10, 16, No. 1, common	15.50	13.50
Timbers, 6 x 6 to 8 x 8, No. 1, common	23.00	20.00
Timbers, 10 x 10 to 12 x 12, No. 1, common	26.00	21.00

A break has also been recorded in the price of cement. Thus the quotations given below for cement in carload lots are from 20 to 30 cents below those of a month ago.

Pittsburgh	$2.17	St. Paul	$2.41
Cleveland	2.43	Toledo	2.51
Indianapolis	2.31	Milwaukee	2.39
Chicago	2.17	Duluth	2.10



The Western Union Telegraph Company has been ordered by Judge Evans of the Federal District Court in Kentucky to remove its poles and wires from the right-of-way of the Louisville & Nashville by November 1. This apparently settles the suits which have been pending since 1912.

The Canadian Government Steamer "Canadian Inventor" has sailed from Vancouver, B. C., for Calcutta, carrying 3,800,000 ft. b. m. of creosoted ties from the Vancouver Creosoting Plant. The ties are being sold in competition with Australian woods.

The recent discovery of large thefts carried out by conductors in taking up tickets on the Pennsylvania has led to the arrest of 10 Pullman conductors and three other persons at Pittsburgh, Pa. The tickets were redeemed as unused through third parties.

A total of 95,000 tons of new steel rails was placed in track by the Pennsylvania System during 1920. Of this total 82,500 tons, or 87 per cent, was 130-lb. rail. Crosstie renewals during the year totaled 5,300,000. The total expenditure for rail and tie renewals for the year was approximately $11,990,000.

The Virginia Railway has recently received 1,000 steel gondola coal cars of 120-tons capacity. The particular feature of these cars is a six-wheel truck of unique design. These cars will be used in coal traffic between Pocahontas fields and seaboard.

The Board of Trustees of the United Engineering Society held its annual meeting on January 27 at which time officers for the ensuing year were elected as follows: President, J. Vipond Davies; first vice-president, Calvert Townley; second vice-president, W. L. Saunders; secretary, Alfred D. Flinn; treasurer, Joseph Struthers; and assistant treasurer, George H. Pegram.

The Directors of the Gulf Coast Lines, in behalf of a group of the principal owners of that road, have offered for sale to the employees a limited amount of stock of the constituent companies at $65 a share (par value $100). It has also been announced that the company will guarantee a return of $6 a share on this stock for a period of 30 months.

Professor W. Z. Ripley of Harvard University has submitted to the Interstate Commerce Commission a report proposing the consolidation of the eastern railroads into a limited number of systems. In accordance with the desires of the commission Professor Ripley is expected to submit a report on the western and southern roads in the near future.

A meeting of all the members of the Construction division of the United States Army living in the vicinity of New York was held at the Aldine Club, 200 Fifth avenue, New York, on February 12, preliminary to attending a reunion of the Construction Division Association at Chicago on February 25. Vance W. Torbert, 200 Fifth avenue, New York, was chairman of the banquet held at Chicago in connection with the reunion.

The American Engineering Council, at the meeting of the executive board at Syracuse, N. Y., on February 14, gave formal approval to the action of the committee on procedure requesting that President Harding put an engineer on the Interstate Commerce Commission. The procedure committee was authorized to name six qualified engineers when requested to do so. It was recommended that engineering efforts be extended to the whole question of government reorganization planned under a special congressional committee.

The American Railway Association has selected the personnel of the executive committee for the calendar year 1921 as follows: Division I, Operating, General W. W. Atterbury; Division II, Transportation, E. J. Pearson; Division III, Traffic, C. H. Markham; Division IV, Engineering, H. G. Kelley; Division V, Mechanical, W. B. Storey; Division VI, Purchasing and Stores, W. G. Besler; Division VII, Freight Claims, N. D. Maher.

A new development for railway cars has been introduced on the New York Central in its express service between New York and Chicago. This consists of a car of the general outline of a gondola car, but designed for high speed passenger traffic and arranged to hold nine steel containers or boxes, having inside dimensions of 9 ft. by 6 ft. by 7 ft. 4 in. and a capacity of 6,000 lbs. These containers are provided with large doors and may be loaded at the warehouses, hauled to the railroad on motor trucks and hoisted from the motor trucks to the car by cranes, the reverse operation being performed at the destination. With this type of equipment, one of these cars may be loaded and unloaded in 40 minutes.

The Pennsylvania Railroad in 1920 lost through fires in railroad property only about one-eighth of one per cent of the insurance value of the property endangered. This was due to the efficient fire prevention methods and the promptness of employees of the road in extinguishing fires in railroad property with the company's fire apparatus before the arrival of the public fire department? Records of the Insurance Department for 1920 recently compiled show that 223 fires were extinguished by fire brigades organized among employees and the fire fighting apparatus installed on the properties of the system. The loss caused by these fires amounted to only 29,000, whereas the efforts of the employees in extinguishing them saved property with an insurance valuation of approximately $23,000,000.

A comprehensive national forestry program is provided for in the Snell Bill now in Congress. This is designed to insure a continuous supply of timber for the people of the United States. It is sponsored by the Forest Service and is supported by the National Forestry Program Committee which has been formed by manufacturers, consumers and converters of forest products to fight for a policy which will mean an adequate continuous supply of raw material. The Committee has secured agreement among the industries using the products of forests upon the measures proposed, as being fair to all concerns and in the public interest. The bill has been introduced and is known as the Snell Forestry Bill and hearings will be arranged at which any points of issue will be clarified and Congress shown how vitally necessary a comprehensive forestry policy is to the industrial and public welfare of the nation.

PERSONAL MENTION

GENERAL

C. O. Congdon, who was recently appointed trainmaster on the Missouri Pacific, with headquarters at Council Grove, Kan., was born at Monticello, Ind., on January 3, 1885, and received his education at Purdue University. He entered railway service with the Vandalia Lines in June, 1906, and in June, 1907, entered the employ of the Missouri Pacific in the engineering department. From January, 1909, until June, 1909, Mr. Congdon served as roadmaster on the Central Kansas division, returning to the engineering department at Osawatomie, Kan., at the latter date. In February, 1910, Mr. Congdon was promoted to assistant division engineer at Atchison, Kan., and in November, 1911, was promoted to division engineer at Coffeyville, Kan., being transferred in June, 1915, to Falls City, Neb. He served in the army transport service in France from March, 1918, until March, 1919, returning to the Missouri Pacific at the latter date as division engineer at Osawatomie, which position he held at the time of his recent appointment.

J. A. Nichols, Jr., whose appointment to the position of assistant trainmaster on the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Mattoon, Ill., was noted in last month's issue, was born at Randleman, N. C., on May 27, 1890, and received his education at the Virginia Military Institute. From 1910 until 1911, he was employed as assistant engineer for the Ganley Mountain Coal Company at Ansted, W. Va., and entered railway service as a concrete inspector with the Florida East Coast Railway in the latter year. Early in 1912, he became a rodman on the Cleveland, Cincinnati, Chicago & St. Louis, and on March 3 was promoted to assistant engineer in the engineering department, with headquarters at Galion, Ohio. From 1915 until August, 1916, Mr. Nichols served as assistant engineer maintenance of way on various divisions of this road and at the latter date was promoted to resident engineer. Mr. Nichols served as captain of field artillery in the United States Army from September, 1917, until August, 1919, part of which time was spent with the Ninetieth division of the American Expeditionary Forces in France and Germany. In August, 1919, he returned to the Cleveland, Cincinnati, Chicago & St. Louis as assistant engineer maintenance of way, which position he held at the time of his recent appointment.

ENGINEERING

C. C. Cunningham, who was formerly division engineer of the Kansas division of the Chicago, Rock Island & Pacific, with headquarters at Herington, Kan., and more recently on the corporate engineer's staff, has been reappointed division engineer at Herington, succeeding **F. Nugent**, transferred.

Paul Sterling, maintenance engineer of the New York, New Haven & Hartford, Lines West, has been appointed assistant to the engineer maintenance of way, with headquarters at New Haven, Conn., effective February 1. **R. L. Pearson**, division engineer of the New Haven and New London divisions, has been promoted to succeed Mr. Sterling as maintenance engineer, Lines West. **E. E. Oviatt**, division engineer of the Danbury division and the Central New England, has succeeded Mr. Pearson and **C. D. Perkins** has succeeded Mr. Oviatt.

C. T. Jackson, one of the two district engineers on the Southern district of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has been appointed principal assistant engineer, with the same headquarters, effective February 21. The two offices of district engineer on the Southern district have been consolidated under the direction of D. C. Fenstermaker, district engineer. Mr. Jackson will be engaged on special assignments by the chief engineer.

Alfred J. Cleary, chief assistant city engineer of the City of San Francisco, who had an active part in the construction and operation of the railway built by that city as a part of the Hetch Hetchy water supply project, has resigned to engage in private practice. **Nelson A. Eckart**, who was in charge of the design and construction of the Hetch Hetchy railway and water supply project, with headquarters at Groveland, Cal., has been promoted to chief assistant city engineer, succeeding Mr. Cleary.

Paul Sterling, who has been promoted to assistant to the engineer maintenance of way of the New York, New Haven & Hartford, as noted elsewhere on this page, was born at Bridgeport, Conn., on March 24, 1870. He graduated from Sheffield Scientific School, Yale University, 1892, and entering the employ of the New Haven as a rodman, the following year. He has remained continually in the service of this company. He served for a time as transitman and assistant engineer on the four-track improvement from New Haven to Portchester. In 1897 he was made assistant engineer of the Berkshire & Shore Line divisions and in 1904 was transferred to the Hartford division, being promoted to assistant division engineer of the New York and New Haven divisions in 1906. Three years later he was transferred to the Midland-Boston division and in 1912 was appointed division engineer of the Midland division, subsequently being transferred to the Highland division in 1914, and to the New York division in 1916. In 1918, he was appointed maintenance engineer of the Lines West and of the Central New England, from which position he was appointed assistant to the engineer maintenance of way, as stated elsewhere on this page.

Paul Sterling

E. R. Lewis, editor of the Maintenance of Way Cyclopedia, one of the publications of the Simmons-Boardman Publishing Company, has been appointed office engineer of the Michigan Central, with headquarters at Detroit, Mich. Mr. Lewis was born on November 20, 1869, at Raritan, N. J., and graduated from the State University of Iowa in 1890. He entered railway service with the Missouri Pacific in 1885 and during the next two years served as axeman and rodman on construction work with that company. During the next seven years he served successfully as levelman, clerk in the timber department, levelman on bridge location, division engineer, and as a reclamation engineer in Wyoming. In 1896, he was appointed division engineer in charge of work on the government levees in connection with Mississippi river improvements. Mr. Lewis spent seven years in construction work on the Cape of Good Hope government railway in South Africa, and from August, 1906, to June, 1912, he served as division engineer on the Michigan Central, with headquarters at Bay City, Mich. On this latter date he was appointed assistant to the general manager of the Duluth, South Shore & Atlantic, with headquarters at Duluth, Minn. His jurisdiction was later extended over all matters pertaining to the engineering department. In February, 1919, he resigned this

E. R. Lewis

position to become editor of the Maintenance of Way Cyclopedia, at the conclusion of which work he resigned to return to the Michigan Central as noted above.

TRACK

Hugh H. Stine, section foreman on the Southern, has been promoted to track supervisor on the Winston-Salem division, with headquarters at Mooresville, N. C., succeeding **J. W. Murdock,** retired.

J. L. Bachar has been appointed roadmaster on the Montello district of the Southern Pacific, with headquarters at Montello, Nev., succeeding **F. E. Johnson,** acting roadmaster, assigned to other duties.

Schoville H. Morgan, whose appointment as roadmaster on the Southern with headquarters at Knoxville, Tenn., was announced in the February issue, was born October 29, 1870, at Bulls Gap, Tenn. He entered railway service in 1887 as a water boy on the East Tennessee, Virginia & Georgia, now part of the Southern. Two years later he was made section foreman on the Southern and subsequently served as extra gang and yard foreman until 1905 when he was made supervisor, being promoted roadmaster with headquarters at Asheville, N. C., the following January. In 1908 he became supervisor and in April, 1917, was promoted to assistant roadmaster at Knoxville, Tenn., from which position he was appointed roadmaster as noted above.

OBITUARY

E. S. Draper, principal assistant engineer of the Boston & Albany, died at his home in Boston, Mass., on February 6. Mr. Draper was born at Wayland, Mass., on February 19, 1883. After attending the public schools at Wayland he entered Tufts College and was graduated with the class of 1904. In January of the following year he entered the service of the Boston & Albany as a rodman and subsequently served that road in various capacities in the engineering department until March, 1912, when he resigned to become a draughtsman for the Stone & Webster Corporation at Boston. In April, 1913, he re-entered the employ of the Boston & Albany as assistant engineer and was appointed engineer of structures in January, 1918. In May, 1920, he was promoted to principal assistant engineer, in which capacity he was serving at the time of his death.

The largest pile driver in the world was used in Sweden for driving piles for a reinforced concrete bridge 3,000 ft. long. The piles, which ranged in length from 75 ft. to 200 ft., were driven by a hammer weighing 10 tons.

PORTLAND CEMENT PRODUCTION IN 1920

The production, shipment and gross value of Portland cement in 1920 was greater than in any previous year, according to estimates prepared by the United States Geological Survey, Department of the Interior. The production is estimated at 100,302,000 bbl. and the shipments at 96,329,000 bbl., valued at $193,548,000, compared with 80,769,378 bbl. manufactured and 85,596,616 bbl., valued at $146,656,076, shipped in 1919, an increase of 24 per cent in production, 13 per cent in shipments and 31.9 per cent in value of shipments in 1920.

The stocks of finished cement increased from 5,852,497 bbl. at the end of 1919 to about 8,290,000 bbl. at the end of 1920, or more than 41 per cent.

The production was not curtailed in November and December in proportion to the decline in demand, and stocks once more began to accumulate, so that at the end of the year more than a month's supply was becoming seasoned for use in 1921.

There were 115 plants that manufactured Portland cement in 1920, compared with 111 active plants in 1919, one additional plant each having operated in Alabama, Indiana, New York and Oregon.

The lowest average price reported by any group of plants in 1920 was $1.77 a barrel in the Illinois-western Indiana district, and the highest average price was $2.47 in Washington. These prices compare with $1.62 and $2.05 in 1919.

CONSTRUCTION NEWS

The Ahukini Terminal & Railway Company has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a narrow-gage line on the Island of Kanai, Hawaii.

The Atchison, Topeka & Santa Fe, which was noted in the February issue as intending to build a complete ice plant at Hobart Station, Cal., at a cost of approximately $500,000, has awarded the contract for this work to C. A. Fellows, Los Angeles, Cal.

This company has awarded a contract for the construction of a frame blacksmith shop at Newton, Kan., to Jerome Moss, Chicago. The Santa Fe will also build new icing facilities at Clovis, N. M., including platforms, at a cost of $21,660. The company's icing facilities at Waynoka, Okla., will be also increased by the construction of additional platforms and ice chutes so as to permit the handling of 44 cars instead of 17, as at present. The work at Waynoka will cost about $30,000.

This road also contemplates the construction of a bridge across the Iowa river about 20 miles west of Fort Madison, Ia., to cost approximately $250,000.

The Atchison, Topeka & Santa Fe Hospital Association is asking for plans and specifications for a 100-room modern hospital, with two stories and basement and a separate building for a nurses' home at Albuquerque, N. M. Dr. J. P. Kaster, Topeka, Kan., is chief surgeon.

The Atlantic Coast Line will build a reinforced concrete bridge, including a draw span, at Moore Haven, Fla., by company forces.

The Carolina, Clinchfield & Ohio will make improvements and additions to its passenger station at Johnson City, Tenn., at a cost of about $7,500. The work will be handled by company forces.

The Chicago Union Station, which was noted in the February issue as accepting bids for the wrecking of the old Chicago & Alton freight house at Harrison street and the Chicago river, has awarded the contract for this work to the W. J. Newman Wrecking Company, Chicago.

The Cleveland, Cincinnati, Chicago & St. Louis is improving its yard facilities at Jeffersonville, Ind., by extending seven yard tracks at a cost of approximately $143,000. The company contemplates other terminal improvements at Jeffersonville in the future.

The Esquimalt & Nanaimo has awarded a contract to the Foundation Company of British Columbia for the construction of a line on the Port Alberni branch, three miles from Port Alberni, B. C., extending for a distance of 10½ miles to Great Central Lake. This will include the construction of a 150-ft. deck lattice girder on concrete piers and four-pile and frame trestles, at an estimated cost of $480,000.

The Great Northern, which was noted in the February issue as accepting bids for the erection of a 500-ton frame coaling station at Troy, Mont., has awarded the contract for this work to the Howlett Construction Company, Moline, Ill.

The Great Northern contemplates the construction of car shops at Minot, N. D.

The Illinois Central contemplates the construction of a viaduct, 700 ft. long and 36 ft. high, on McLemore Avenue, over South yards, Memphis, Tenn.

This company contemplates extensions to its roundhouses at Dubuque, Ia., Waterloo, Ia., and Freeport, Ill., to handle new and heavier equipment which is now being delivered.

The Live Oak, Perry & Gulf has begun the reconstruction of its blacksmith and car shops at Live Oak, Fla. The buildings will be of frame construction, 50 ft. by 60 ft., and 60 ft. by 150 ft., respectively. The following new machinery will be purchased: a plane, a shaper, a drill press and a wheel press.

The Louisville & Nashville has awarded a contract to the Union Bridge & Construction Company, Kansas City, Mo.

for the construction of foundations and masonry for a bridge across the Alabama river near Montgomery, Ala.

This road also has awarded a contract to H. W. Hancock, Louisville, Ky., for the construction of a roundhouse and shops at Loyall Yard, Baxter, Ky., to cost approximately $155,000.

The Minneapolis, St. Paul & Sault Ste. Marie contemplates the construction of a brick passenger station and a new freight house at Menasha, Wis., at an estimated cost of approximately $100,000.

The Missouri, Kansas & Texas is making location surveys for the line it contemplates building from Austin, Tex., to San Marcos, a distance of 31 miles.

This company, which was announced in the February issue as accepting bids for the construction of a reinforced concrete inbound freight house at Dallas, Tex., has awarded the contract for this work to Hickey & Montgomery, Dallas.

This road has also awarded a contract to T. H. Johnson, Sedalia, Mo., for the construction of a one-story brick passenger station, 21 ft. by 60 ft., at North Jefferson, Mo., replacing a frame structure destroyed by fire. This station will cost approximately $13,000.

The Mount Streeter Railroad Company has awarded a contract to the James V. Stryker Construction Company, Denver, Colo., for the construction of a line from Meeker, Colo., through Mount Streeter, Colo., and Craig to Wamsutter, Wyo., a distance of 150 miles. The project will cost $10,000,000 and the company expects to complete it within three years.

The Northwestern Pacific is preparing plans for improvements on its terminal at Sausalito, Cal.

The Oregon Short Line contemplates the construction of a new timber-treating plant at Pocatello, Idaho.

The Patterson & Western has applied to the Interstate Commerce Commission for a certificate authorizing the abandonment of its line between Patterson and Jones Station, Cal., a distance of 23.6 miles.

The Red River Valley has completed surveys for a line from Fargo, N. D., north to Alvarado, Minn., a distance of approximately 100 miles. The project was abandoned temporarily during the war, but has been revived and the company plans to begin construction of this line during the present year.

The Southern Pacific, which was recently ordered by the Railroad Commission of California to improve its depot facilities at Oakland, Cal., has asked for a rehearing, stating that an Oakland syndicate will build a six-story office building, including station facilities, on depot site under a 50-year lease.

The Western Maryland has awarded a contract to the Wellman Seaver Morgan Company, Cleveland, Ohio, for the erection of a ship coal handling device of steel construction at Port Covington, Baltimore, Md.

IRON AND STEEL

The Chicago & Eastern Illinois has ordered 100-per cent rail joints from the Rail Joint Company, to be used with the recent order for 2,500 tons of steel rails ordered from the Illinois Steel Company, 750 tons of which are 100-lb. rail.

The Erie ordered 5,000 kegs of standard spikes from one of the larger independent companies.

The Government of Mexico is inquiring for 2,000 tons of 60-lb. steel rails.

The Los Angeles & Salt Lake is inquiring for 10,000 tons of rails.

The Missouri, Kansas & Texas has ordereed 14,000 tons of rails from the Illinois Steel Company.

The Missouri Pacific has ordered 150 tons of plate girder spans from the American Bridge Company.

The Oregon-Washington Railroad & Navigation Company has ordered 10,000 tons of rails from the Illinois Steel Company.

The Union Pacific has ordered 10,000 tons of rails from the Illinois Steel Company.

SUPPLY TRADE NEWS

GENERAL

The Federal Engineering Company has been organized to specialize in railway plumbing, heating and power plant work. The headquarters of the new firm are at 3240 South Michigan boulevard, Chicago, and the company will maintain a branch office at Kansas City, Mo.

The O'Malley-Beare Valve Company of Chicago has been appointed exclusive agent for the Chapman Valve Manufacturing Company of Indian Orchard, Mass., and will have charge of the sale of the Chapman lines of valves in the railway field over the entire United States.

The Forman-Bassett Company, Cleveland, Ohio, have opened new headquarters in the Hotel Cleveland for the sale of the **General Fireproofing Company's** line of steel office equipment, expanded metal lath, concrete reinforcement and waterproofing compounds. **F. W. Wagner** is sales manager in charge of the branch.

The Hazard Manufacturing Company, Wilkes-Barre, Pa., opened a new sales office and warehouse at 1701-1703 First avenue, Birmingham, Ala., on February 1. This is in charge of **R. J. Bravand,** district manager, who has been with the Hazard Manufacturing Company for twenty-two years, partly at the plant and partly in the field.

The Austin Machinery Corporation of Louisiana has been incorporated under the laws of that state as distributors for Louisiana, Arkansas, Mississippi and Tennessee for the products of the Austin Machinery Corporation. The capitalization is represented by $100,000 of preferred stock and $200,000 of common stock. The general offices of the corporation will be at 1020 Maison Blanche building, New Orleans, La.

The Concrete Mixer Association held its annual election of officers on January 28 at Chicago, at which time the following were elected: President, Clifford S. Messinger, general sales manager of the Chain Belt Company, Milwaukee, Wis.; vice-president, W. B. Knickerbocker of the Knickerbocker Company, Jackson, Mich.; treasurer, A. T. Scannell of the Archer Iron Works, Chicago. H. E. Smith, president of the T. L. Smith Company, Milwaukee, Wis., was made chairman of the executive committee, while P. A. Koehring, secretary of the Koehring Machine Company, Milwaukee, Wis., and Z. W. Carter, sales director of the Austin Machinery Corporation, Chicago, were elected members of the executive committee.

The Toledo Crane Company, Bucyrus, Ohio, successor to The Toledo Bridge & Crane Company, Toledo, has been chartered under the laws of Ohio, with the following officers: **C. F. Michael,** president; **W. F. Billingsley,** vice-president and general manager; **A. G. Stoltz,** treasurer, and **C. Gallinger,** secretary. The officers with **C. H. Dexheimer** are the stockholders and directors. All stock has been subscribed and paid in and none will be offered for public subscription. The main office is at Bucyrus, with sales offices in New York City, Boston, Philadelphia, Pittsburgh, Buffalo, Cleveland, Cincinnati, Chicago, St. Louis, Kansas City, Seattle, Salt Lake City, San Francisco, Birmingham and Minneapolis. The company will have completed by March 15 a building 120 ft. by 320 ft., to be used for erection and assembly, with a machine shop 60 ft. by 300 ft., a structural shop 90 ft. by 300 ft., a pattern shop 60 ft. by 140 ft., and a forge shop 40 ft. by 100 ft., all to be equipped with modern tools.

PERSONAL

J. D. Shaver has been appointed sales manager of the Cleveland Crane & Engineering Company of Wickliffe, Ohio.

John Hyland, formerly manufacturers' agent at Atlanta, Ga., is now in the sales department of the Lehon Company, with headquarters at Chicago.

A. E. Brown has been appointed general manager of the railroad department of the Truscon Steel Company, with headquarters at 22 West Monroe street, Chicago.

G. Lewis Taylor, for the past 12 years assistant chief engineer of the McClintic-Marshall Company, Pittsburgh, Pa., has been promoted to chief engineer, succeeding **Paul L. Wolfel,** deceased.

George J. Blanton, who for the past four years has been connected with the engineering sales department of the Chain Belt Company, Milwaukee, Wis., has been appointed New York district manager for this company. Mr. Blanton entered the service of the Chain Belt Company in 1917, previous to which he had been for eight years with the General Electric Company. Of this time he spent three years in Schenectady, N. Y., and five at Milwaukee, Wis. Mr. Blanton is a graduate of the University of Michigan, College of Mechanical and Electrical Engineering, class of 1909.

Harry L. Oviatt has been appointed traveling representative of the Armstrong Manufacturing Company, Bridgeport, Conn., manufacturers of pipe threading tools and taps. Mr. Oviatt has been with the Bullard Machine Tool Company for the past 13 years and has been connected with the advertising department for the past three years.

J. L. Jackson employed by the Duncan Lumber Company of Portland, Ore., since 1913, has been appointed manager of the West Coast department of the Mummert Lumber & Tie Company, with headquarters at Chicago. Mr. Duncan was connected with the Douglas Fir Sales Company also of Portland previous to his connection with the Duncan Lumber Company.

Clifford J. Ellis, district manager of sales for the Midvale Steel & Ordnance Company and the Cambria Steel Company, with headquarters at Chicago, Ill., died at his home in Evanston, Ill., on January 31. Mr. Ellis had been district manager of sales for more than 30 years and for 37 years had been in the service of the Cambria Steel Company at Chicago. He was born on November 25, 1860, and when 19 years of age entered the employ of Wood Morrell & Co., Johnstown, Pa., who controlled the Cambria Iron Company. Not long thereafter he became assistant to the treasurer and in 1883 he was transferred to Chicago, entering the sales department of the company, where he had served up to the time of his death.

C. J. Ellis

Max Grant, who has been associated with the Tropical Paint and Oil Company, Cleveland, Ohio, has been appointed manager of technical railway sales, of the Glidden Company, Cleveland, and **M. F. Emrich,** formerly vice-president and general manager of the Campbell Paint & Varnish Company, St. Louis, a subsidiary of the Glidden Company, has been appointed general sales manager of the industrial division of the Glidden Company, with headquarters at Cleveland.

N. C. Hoyles has been appointed manager of the Cincinnati, Ohio, branch of the Pittsburgh Testing Laboratory, Pittsburgh, Pa. From 1909 to 1914, Mr. Hoyles was manager of the Birmingham (Ala.) branch of this company. In 1914 he joined the Canadian military forces, went overseas with the Canadian engineers, and at the close of the war left the service with the rank of lieutenant-colonel. For the past year he has been assistant manager of the Pittsburgh Testing Laboratory's New York office.

E. D. Kellogg has been appointed New Jersey representative for the Conveyors Corporation of America, Chicago. Mr. Kellogg will handle the American trolley carrier and the American steam jet conveyor in the northern half of New Jersey, with his headquarters at the eastern office of the company, 110 West Fortieth street, New York. Mr. Kellogg graduated from Stephens Institute of Technology in 1898, and specialized in the design and construction of steel structures in this country and Canada until 1916, when he entered the material handling field with the Terry Manufacturing Company, New York.

Robert C. Weller has been appointed general sales manager of the Lakewood Engineering Company with headquarters at Cleveland, Ohio. **Carlton R. Dodge** has been appointed western sales manager with headquarters at 1215 Lumber Exchange building, Chicago.

W. J. Roehl, formerly assistant purchasing agent on the Missouri Pacific, has been appointed sales representative in the St. Louis, Mo., district for A. M. Castle & Co.

Frank P. McCaughey, a member of the firm of McCaughey Brothers, railroad contractors, died suddenly at his home in Chicago on February 4. Mr. McCaughey entered the railroad contracting field with his two brothers, John J. and Patrick E., in 1882.

TRADE PUBLICATIONS

Locomotive Cranes, Crawler Cranes and Crawler Shovels.—Victor R. Browning, Cleveland, Ohio, has issued three eight-page bulletins describing the line of cranes and shovels and dragline excavators manufactured by that company. The superstructure of these cranes may be mounted on double trucks or single trucks for operation on standard-gage railway tracks or on caterpillar travelers. The use of grab buckets, shovel buckets and dragline excavators is also illustrated.

Steel Structures for Railroads.—The McClintic-Marshall Company, Pittsburgh, Pa., has recently issued a 12-page illustrated booklet on railway steel structures. The illustrations include views of typical structures such as terminal buildings, freight stations, engine houses, bridges, shops and other miscellaneous structures, the steelwork for which was secured and erected by this company.

Manual of Standard Wood Construction.—The eighth edition of the Manual of Standard Wood Construction has been issued by the Southern Pine Association, New Orleans, La. This edition contains additional technical information and tables for use in designing composite and all-wood structures of which the following headings are indicative: Minimum line floor loads; safe column loads; sheet piling; lattice trusses; design for Howe roof truss, etc.

Traveling Coaling and Cinder Plant.—The Roberts & Schaefer Co., Chicago, has issued Bulletin 40, 15 pages illustrated, descriptive of the new "Rands" patent traveling railroad coaling and cinder plant with ground storage equipment. The information given contains illustrations and drawings of this movable plant while the text gives the complete data on its capacities for handling coal from storage to hopper, from storage to locomotive tender, and from hopper to tender.

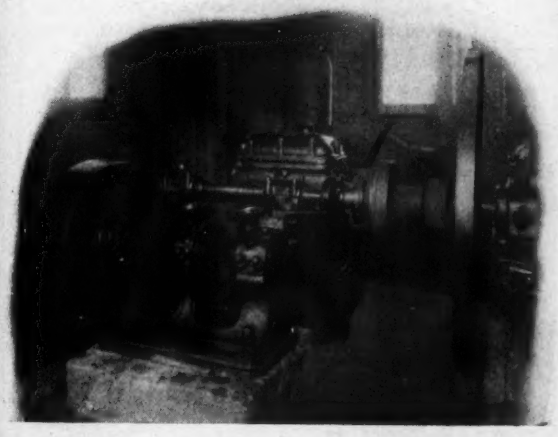
The Commonwealth Steel Company, St. Louis, Mo., has recently established an employees' benefit association, which provides insurance against sickness, accident or death for the employees. The company has offered to each member of its force a life insurance policy, varying in amounts from $500 to $2,000, depending on the length of service.

Detailed figures compiled by the Bureau of Foreign and Domestic Commerce show that spikes weighing 3,158,612 lb. and valued at $143,177 were exported during December, Cuba being the destination of by far the largest shipments of this material. Rails valued at $3,324,802 and weighing 52,986 tons were the month's totals. The exports of switches, frogs, splice bars, etc., were valued at $784,108.

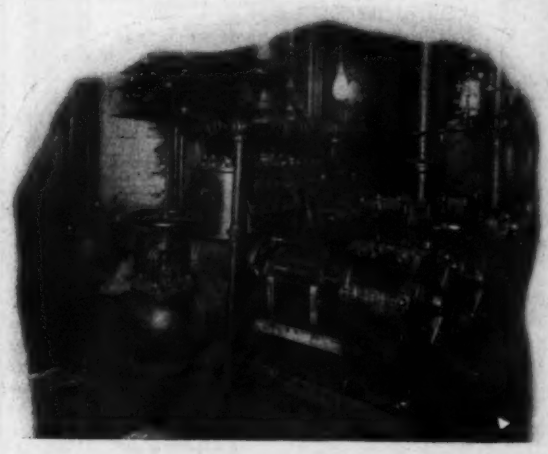
The Steam Transportation Committee of the Chicago Safety Council has requested all of the railroads to provide the headquarters' office with information with respect to accidents to school children while trespassing on railroad premises. It is intended that this information shall be compiled periodically and forwarded to the superintendent of schools, who in turn will place the data before all the scholars in bulletin form. In line with its work the committee is urging that safety instruction be made a part of the school curriculum.

GARDNER

Pumps-Governors-Compressors



Gardner Power Pump installed in shops of one of our leading Railroads. Used for pumping water. Fills a 65,000 gallon tank in 3 hours. In service one year *without any repairs.*



Gardner Steam Pump used for pumping water for boiler washout. In service *four years* and has given excellent service.

Purchasing Agents, Chief Engineers and Shop Superintendents of our leading Railroads have formed the habit of specifying "Gardner" when buying Pumps, Compressors and Governors.

There could be no better evidence that Gardner Products have made good.

For 62 years this trade-mark has stood for the best machinery which can be built. Let it govern your purchases.

WRITE: Gardner Bulletin No. P23 —Duplex Power Pumps—is ready. A copy to you upon request.

GARDNER TRADE MARK

THE GARDNER GOVERNOR COMPANY
Quincy, Illinois

Pumps --- Governors --- Compressors

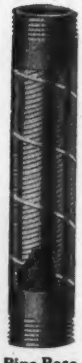
Chicago	New York	Philadelphia	San Francisco	Los Angeles
Fisher Bldg.	Singer Bldg.	604 Arch St.	505 Howard St.	409 E. Third St.

The JOHNSON WELL SCREENS

Brass Screen

Many persons are under the impression that a Johnson Well Screen is necessarily of all-brass construction. Not so. In cases where this type does not possess the required stamina, such as driving ahead of the pipe, there is a Johnson Screen to fit. When utmost strength is the governing factor in the selection of a well screen see that a Johnson Pipe Base Screen is specified. It will stand up under the most trying conditions. Bulletin No. 18 illustrates both Johnson Well Screens.

Let us show you how to use them advantageously.



Pipe Base Screen

Manufactured by

Edward E. Johnson, Inc.

St. Paul **Minn.**

Dependable Fibre for Railroad Work!

Made to excel—not merely to meet specifications. Backed by a thorough knowledge of railroad conditions and requirements. Built upon formulas based upon prolonged use and severe tests.

Diamond Fibre for plates, bushings, gaskets, handles, fuse coverings, and insulations purposes will serve you just as faithfully as it is now serving the biggest railroads in the country. You can *bank* on it.

Dept. 12

Diamond State Fibre Company

Bridgeport (Near Philadelphia), Penna.

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Offices in Principal Cities

In Canada, Diamond State Fibre Co. of Canada, Ltd., Toronto

Paint Elasticity

Frequently the natural elasticity of paint is lost through chemical combination of pigment and vehicle.

DIXON'S Silica-Graphite PAINT

however, retains this natural elasticity because its pigment, flake silica-graphite, is inert and can not chemically combine with the linseed oil vehicle.

Due to the lubricating qualities of the graphite, it spreads easily and evenly, while the silica provides sufficient "drag" to prevent too thin a coat.

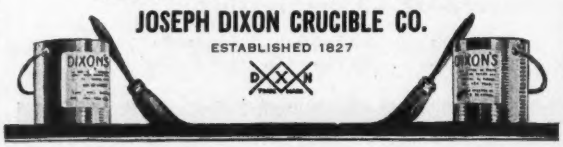
Dixon's Paint, because of this elastic quality, is able to withstand the expansion of heat and contraction of cold without cracking and peeling.

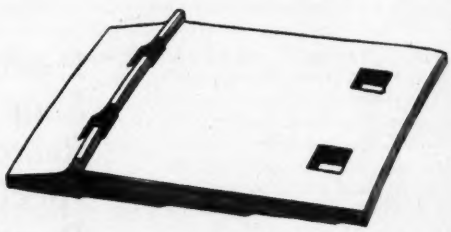
Write for Booklet 187B and prices.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE CO.

ESTABLISHED 1827





The Lundie Tie Plate

The Lundie Tie Plate is widely acknowledged by railroad men having such plates in track, as promoting decided economy in rail wear, in holding track to gauge and in giving easy riding track. It will far more than pay for itself in reduction of Operating Expenses.

The features of the plate are—a sloping seat inclining the rail, so reducing abrasion and internal stresses in the rail to a minimum—a true camber promoting easy riding—and a bottom, as shown in the cut, so seating itself on the tie that the track is held firmly to gauge without injury to the tie.

The combination of these features, or their mechanical equivalent, is covered by Letters Patent, supported by other Patents covering certain individual features of the plate. Railroad companies pay no royalties on its authorized use.

The Lundie Engineering Corporation

920 Broadway, NEW YORK

Chicago Office, 30 North La Salle Street

Pelton Steel Co.

MILWAUKEE, WISCONSIN

Manufacturers of

Open Hearth and Electric Castings

of

Plain Carbon Alloy or Manganese Steel

High grade steel is a necessity for bridge castings, gears and the like upon which dependence must be placed for safety and continuity of service.

For parts of heavy mechanism of this character subject to constant wear under heavy pressure, nothing is known that will resist wear through a long life like manganese steel.

Good steel castings save breaks in service.

PELTON STEEL CO.

Knows how to make them
Makes them every day
Is organized for quality production
Gives exceptional service for ordinary prices.

Specialists
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Design and Manufacture
of

Standard—
Insulated—
Compromise

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ROOFING

The original asphalt ready-to-lay roofing. Made from the same formula for over 28 years.

Smooth surfaced, fine talc dusted finish. Special large-headed sherardized (zinc impregnated) nails and Ru-ber-ine Cement in each roll.

Ru-ber-oid Roofing wears longer than ordinary prepared roofings, therefore, most economical.

RU-BER-OID UNIT SHINGLES

Green or red, slate surfaced, 8"x15¼", 5 inch exposure.

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THE STANDARD PAINT COMPANY
95 Madison Avenue, New York
CHICAGO BOSTON

SPRACO

Painting Equipment

The SPRACO PAINT GUN does not merely "lay the paint on." *It DRIVES the paint into the corners*—into the cracks and seams and around the rivets. Just one badly driven rivet is enough to let in the rain and start corrosion—resulting in an expensive repair job which could have been avoided by *driving* the paint in with a SPRACO PAINT GUN. There is no use in "saving the surface," unless you save ALL the surface.

Write for Bulletin No. P-28

Spray Engineering Co.
BOSTON, MASS.

Mfrs. also of Spraco Air Washers and Cooling Ponds, Spraco High Temperature Cement Sprayers, Spraco Nozzles, Vaughan Flow Meters, etc.

The Stowell Company

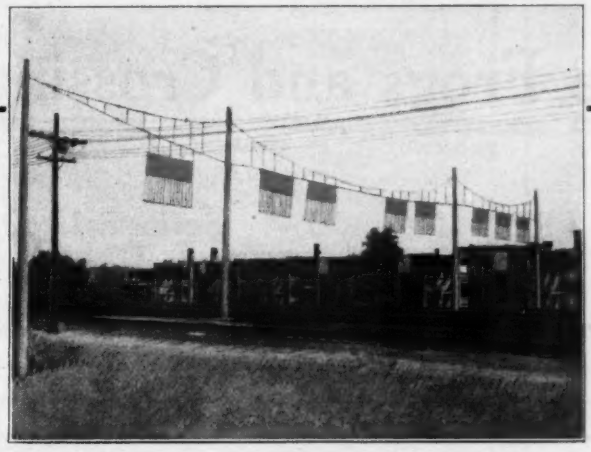
FOUNDERS AND MANUFACTURERS

South Milwaukee, Wisconsin

"Certified" Malleable Castings
Electric Steel Castings

Castings made, handled and tested in accordance with rigid and scientific methods.

Mail us your inquiries



Concrete Poles for Bridge Warnings

Massey Hollow Reinforced Concrete Poles readily adapt themselves as supports for bridge warnings.

Made by a special centrifugal process—they are light and have all the strength of steel poles, combined with the permanence, rigidity and lack of maintenance expense which characterize reinforced concrete.

Massey Concrete Products Corporation
Peoples Gas Bldg., Chicago

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Dallas Sumpter Bldg. | St. Louis Ry. Exch. Bldg. | Salt Lake City 925 S. 6th St., W.

Aeron Painting System
Surpasses Brushing

Portable Painting Equipment

will solve your painting problems. This equipment is used for spray-painting bridge and every other class of maintenance job. It averages 4 or 5 times faster work than hand-brushing. The surface is more completely covered, the coating more even and longer lasting. The same paints now used are applied, no more required. The outfit is compact, reliable and easy to move about.

More definite information will be gladly mailed to you.

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3682 Detroit Ave., *Toledo, Ohio*

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TRACK WORK OF QUALITY

Manufacturers of Balkwill Articulated Cast Manganese Crossings

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TRASCO
STEP JOINT
CAST STEEL

Perfect Fit
Safe—Strong and Reasonable in Price

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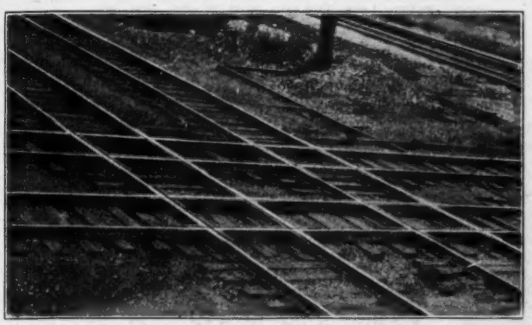
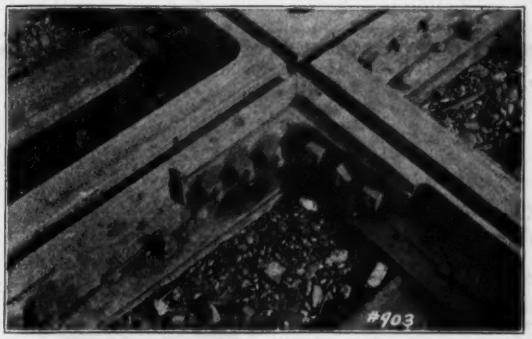


Four Balkwill Articulated Cast Manganese Crossings, approximately 90°, installed by Pennsylvania R. R. and Chicago Belt near 75th St., Chicago.
(Two Heavy Duty Type, 64 bolt assembly. Two Intermediate Type, 40 bolt assembly)



A corner in one of the Heavy Duty Type Crossings shown above.
Manufactured by Morden Frog and Crossing Works, per Balkwill Drawing No. 11.

Over half a thousand ***Articulated Cast Manganese Crossings*** of various types have been sold to the following Railroads:

Atlantic Coast Line R. R.
Atchison, Topeka & Santa Fe R. R. (Santa Fe)
Baltimore & Ohio R. R.
Baltimore & Ohio Chicago Terminal R. R.
Big Four R. R.
Butte, Anaconda & Pacific R. R.
Central California Traction R. R.
Chesapeake & Ohio R. R.
Chicago & Alton R. R. (Alton)
Chicago, Burlington & Quincy R. R. (Burlington)
Chicago & Eastern Illinois Ry.
Chicago, Rock Island & Pacific R. R. (Rock Island)
Chicago & Western Indiana R. R. (Chicago Belt)
Duluth, South Shore & Atlantic Ry.
Elgin, Joliet & Eastern R. R. (Chicago Outer Belt)
El Paso & Southern R. R.
Erie Railroad
Fresno Traction Company
Grand Trunk Railway
Gulf, Colorado & Santa Fe R. R.
Hocking Valley Railroad
Houston Belt & Terminal Company
Illinois Central Railroad
Louisville & Nashville R. R.
Minneapolis, St. Paul & Sault Ste. Marie (Soo Line)
Missouri Pacific Railroad
New York Central Lines
New York, Chicago & St. Louis R. R. (Nickel Plate)
New York, New Haven & Hartford R. R.
Northwestern Pacific R. R.
Pacific Electric Railway
Pennsylvania Lines
Peoria & Pekin Union
Pere Marquette Railroad
Portland & Southwestern R. R.
Richmond, Fredericksburg & Potomac R. R.
Seaboard Air Line Railroad
Southern Railway
Southern Pacific System
Stockton Electric R. R.
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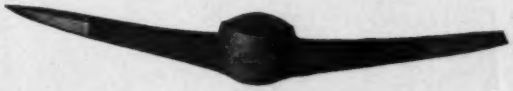
Send to us for a complimentary set of detail drawings for crossings from 90° to 35°

The Balkwill Manganese Crossing Co.
Williamson Building, CLEVELAND, OHIO

PICKS



No. 5

Made of best high-grade open hearth steel, hammer forged and correctly tempered. Finished in black with polished points.

The Warren Tool & Forge Company
243 Griswold Street : WARREN, OHIO
U. S. A.

Sullivan Water Boosters

discharge water horizontally or to an elevation, using the same air which raised it from your wells to the surface.

Sullivan Cyclone Boosters

are economical and automatic. They are admirably suited for

RAILWAY TRACK TANK SERVICE

Several wells with a booster on each may be pumped from a central air compressor.

Bulletin 1971-D.

Sullivan Machinery Co.
411 Gas Building
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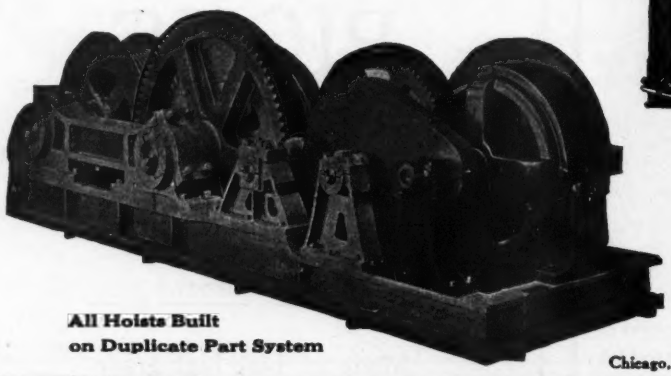
Sullivan Booster Discharging into Elevated Tank



All Hoists Built
on Duplicate Part System

LIDGERWOOD CAR HAUL

Endless Rope Electric Car Haul Hoist. Pull 17,500 lbs. at 75 F. P. M. Built for Pennsylvania R. R. Co.

We build hoists suitable for every character of railroad work

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Lidgerwood Mfg. Company
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Chicago, Philadelphia, Pittsburgh, Seattle, Los Angeles, London, Eng.

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LUFKIN TAPES

In Grades and Styles best suited to every class of **Railroad Work, Engineering, Construction, Maintenance.**

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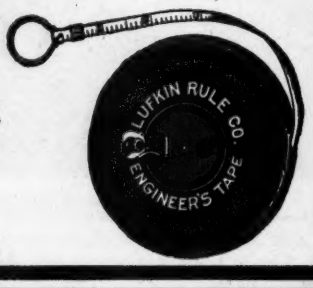
RECOGNIZED STANDARD FOR YEARS
STOCKED BY SUPPLY HOUSES



THE LUFKIN RULE CO.
New York SAGINAW, MICHIGAN Windsor, Canada

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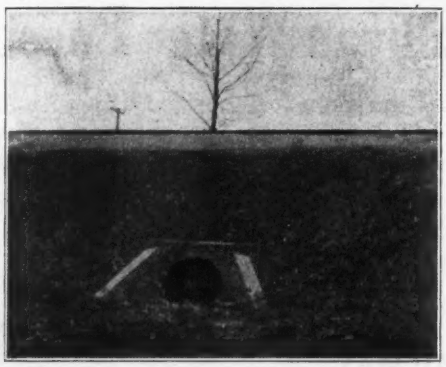

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comes to you in 3, 4 or 5 foot lengths. That's what makes it so easy to handle and install. No waste. No piles to drive. No fills to remove. No tunneling. Cast from pure remelted Alabama pig iron, which will not rust.

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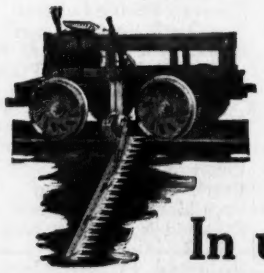
RAWLS TRACKMOWER



An attachment for motor, hand or push car, operated by section men.

In use on 25 railroads

We specialize in trackmower equipment only.

RAWLS MACHINE AND MANUFACTURING CO.
1412 North Halsted Street, Chicago, Ill.

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For long life and resistance to wear there is nothing known that equals

MANGANESE STEEL

Manganese steel track structures have amply demonstrated their durability under severe service conditions. Railbound manganese frogs, installed in tangents in high speed main lines as early as 1903, still remain in the track and in good condition. In the curved connections of terminals many manganese steel frogs have had a life equal to that of 25 frogs made of Bessemer steel.

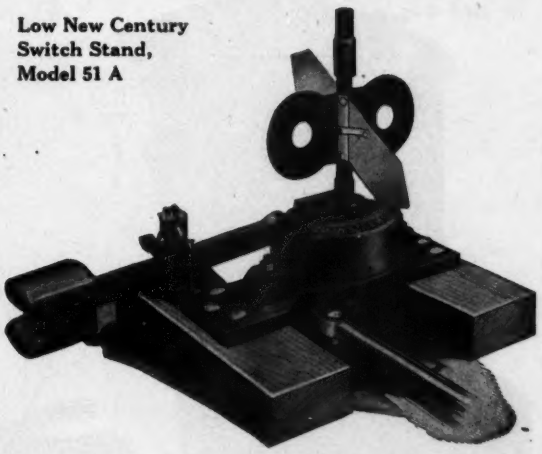
AMSCO Manganese Steel for Dippers and Dipper Teeth of Steam Shovels and Dredges has solved the great economic problem of this class of machinery —continuity of operation.

American Manganese Steel Company

CHICAGO

New Century Switch Stands

Low New Century Switch Stand, Model 51 A



Adjustable, easy to throw, heavy construction, parts interchangeable, several styles of cranks for main line, yard or terminal—also furnished in high models.

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Frogs
Switches
Crossings
Switch Stands
Special Layouts

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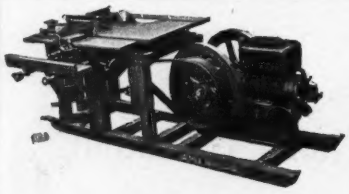
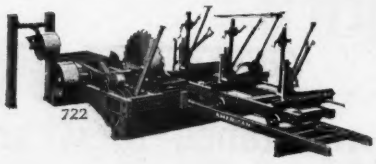
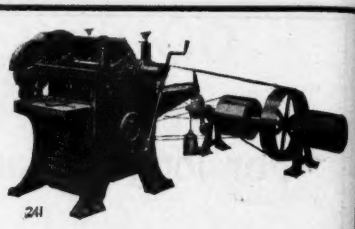
SOLE EXPORTER OF OUR COMMERCIAL STEEL AND IRON PRODUCTS CONSTECO CONSOLIDATED STEEL CORPORATION 165 BROADWAY, NEW YORK, U.S.A.

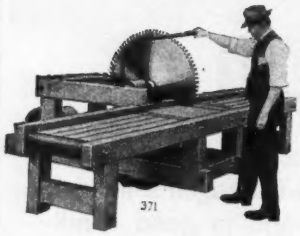



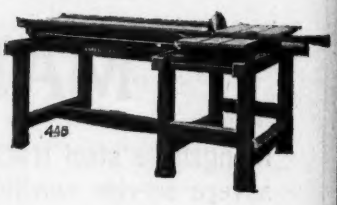


AMERICAN

Saw Mills and Wood Working Machinery

Reduce Your Maintenance Costs

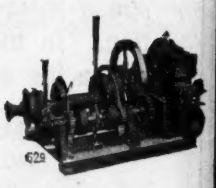




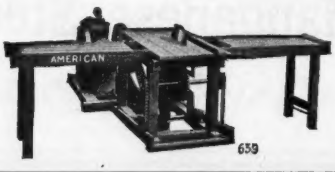
Good lumber from old bridge timber and other waste at cost of resawing.

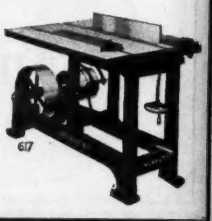
An American Portable Wood Worker or Cut-off Saw will pay for its cost on one construction job.

Use American Wood Working Machinery—
Band Saws, Planers, Jointers, Swing Saws, Saw Benches



American Saw Mill Machinery Co.
140 Main Street Hackettstown, N. J.



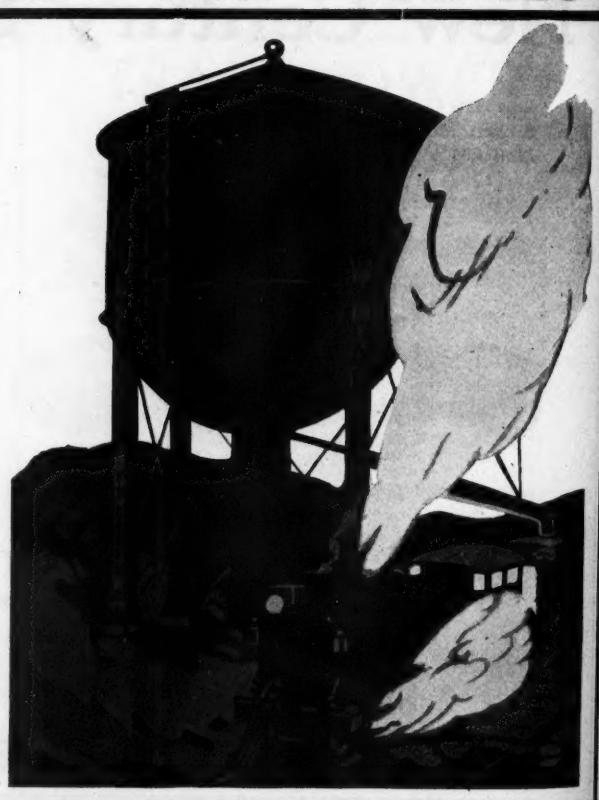


DES MOINES RAILWAY SERVICE TANKS

Use Des Moines Service Tanks, and cut out all maintenance cost except for an occasional coat of paint.

Furnished for mild or for cold climate, after our standard design, or built to your own specifications.

Write for special Railroad Catalogue No. 42.



Pittsburgh-Des Moines Steel Company

842 Curry Building Pittsburgh, Pa.

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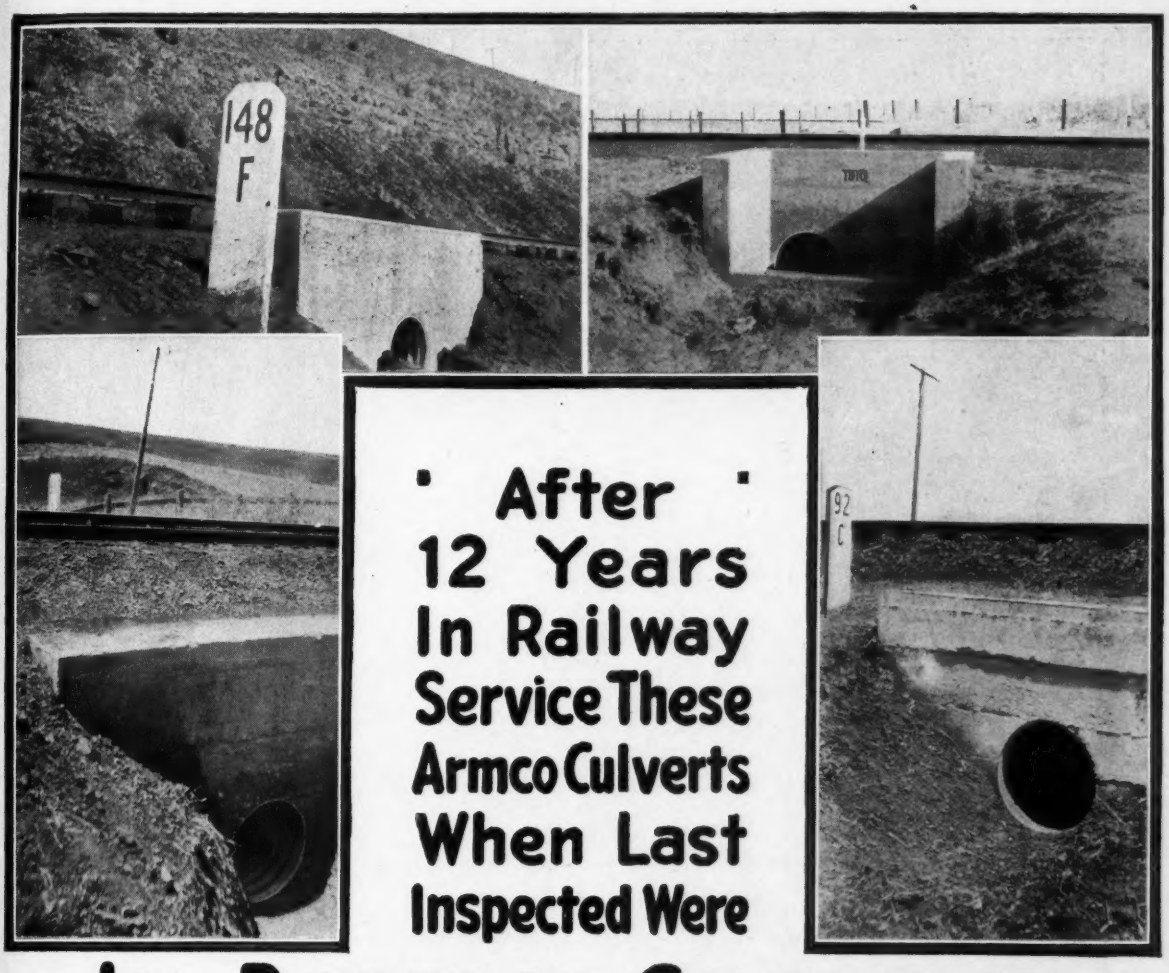
CHICAGO, 1242 1st Nat'l Bank Bldg.
WASHINGTON, 942 Munsey Bldg.
SAN FRANCISCO, 342 Rialto Bldg.
DALLAS, 1242 Praetorian Bldg.

Canadian Des Moines Steel Co., Ltd., 242 Inshes Ave., Chatham, Ont.

DES MOINES



After 12 Years In Railway Service These Armco Culverts When Last Inspected Were IN PERFECT CONDITION

Because they are economically transported, are easily and quickly installed, and make permanent improvements, railroads are using Armco Culverts in greater numbers each succeeding year.

Up to 5,000 feet of Armco Culverts, in diameters of 30 inches and less, may be loaded on a flat car and the total weight will be well within the capacity of the car. Hence transportation charges per unit section are extremely low when Armco Culverts are used.

The actual work of installation in the majority of cases is quickly and easily done by common labor—the usual method being to dig a trench and roll the culvert in. Concrete and rubble head walls—although not absolutely necessary, because of the rodded end construction of Armco Culverts—add to the appearance of the job and give extra protection to the culvert ends.

But in addition to these favorable points the *permanence* of Armco Culverts makes them preferred by railroad engineers. Once installed they are there to stay, for the chemical purity, homogenous texture and heavy galvanizing of Armco Ingot Iron from which Armco Culverts are made insures rust resistance and long service.

ARMCO Ingot Iron — Resists Rust

There is a manufacturer in nearly every state, and in Canada, making genuine rust-resisting ARMCO CULVERTS and other products of Armco Ingot Iron such as flumes, siphons, tanks, road signs, roofing, etc. Write for full information and nearest shipping point on products in which you are interested.

ARMCO CULVERT & FLUME MFRS. ASSN.
215 NORTH MICHIGAN AVE. CHICAGO

A Good Time To Get Busy

For Four Reasons (Maybe More):

1. The season within which most maintenance of way work must be done is about to open.

2. Only compulsory maintenance work has been done for several years.

3. Most of the work that railroads would have been glad to do last year was held up for lack of funds.

4. The Winslow Bill, authorizing and directing the Secretary of the Treasury to honor certificates of the Interstate Commerce Commission for instalment payments on account of their guaranty, which is now a law, releases for prompt payment a large part of the sums still due the roads from the government, estimated at about $370,000,000.

Now, if straws show which way the wind blows—at any rate they do not arrange themselves crosswise of the currents of air—this means that many estimates will come out of their pigeon holes.

Some of those orders that have been withheld will be placed.

Are you in line to get your share of them?

Another thing: This month is Engineering and Maintenance month—so-called first, perhaps, because the annual meeting of the American Railway Engineering Association is always held in March.

All railway officers have their attention strongly directed toward their physical properties and what they need to put them in good condition.

It is the psychological moment for the manufacturers of railway supplies used in maintenance of way to get busy and let these same railway officers know exactly what they have that should be used in this great work.

The **Railway Maintenance Engineer** is the medium that reaches all these officers and will furnish a monthly reminder of your product. It is their paper and the reminder is therefore made under the most favorable auspices.

On top of the other reasons, the passage of the Winslow Bill will set a lot of wheels in motion. Railroads can buy supplies, supply houses can pay their bills and take up their notes, workmen can pay for their homes—and everything.

"1921 Will Reward Fighters"